OS 期末群組計畫:Swimming pool Problem

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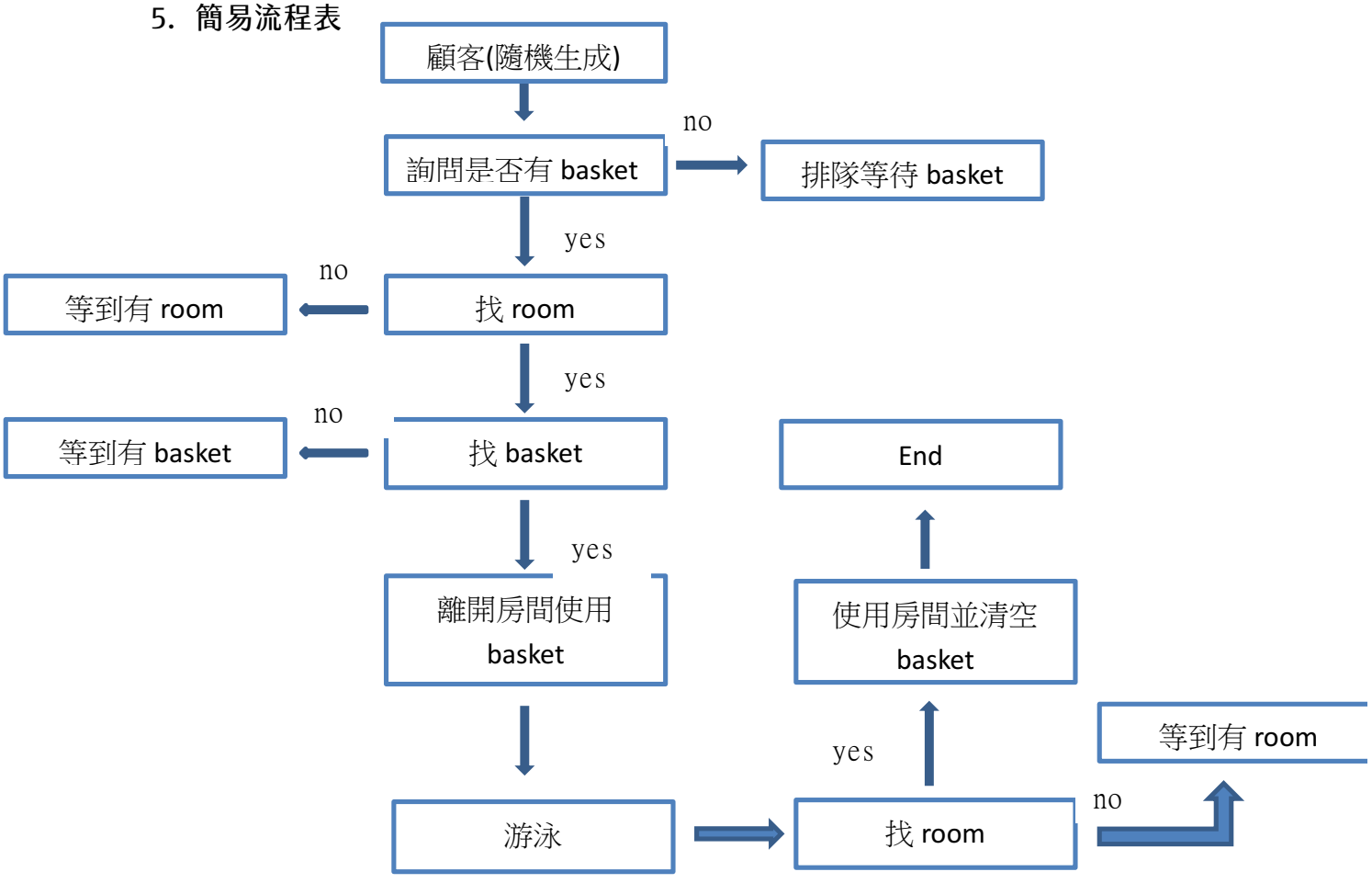
1. 內容簡介:
   問題內容為泳客進出泳池都必須使用 room 更衣且要使用 basket 放衣服，實作出同步機制有關游泳池的運行並且利用 Poisson process，游泳池運作包括進入和離開，解決 basket 及 room 的同步問題並避免 deadlock，且動態生成 customers，且可動態配置 basket 和 room 的數量
2. 組員分工:
   陳逸夫: multithread 程式設計及防止 deadlock 機制及 Poisson process。
   江明達: 動態擴充的設計和書面報告。
3. Thread 類型及功能
   1. 顧客:動態產生人員並且依次去使用 basket 及 Room
4. Multi-Thread 的共有資源與共享變數
   1. Basket:動態產生籃子個數用來放置衣服，進入更衣間前必須取得。
   2. Room:動態產生更衣間個數，提供給進出泳池顧客使用。
5. 簡易流程表



6. 程式碼

1.Demo.java

```
package os;
import static java.lang.Math.random;
import java.util.*;
import java.util.Scanner;
public class Demo {
        public static int[] ROOMS = new int[5];
        public static int[] BASKETS = new int[10];
        public static int basket=0;
        public static void main(String[] args) throws
InterruptedException {
                    int num1;
                    int num2;
                    int customers;
      java.util.Scanner scanner = new java.util.Scanner(System.in);
                System.out.println("ENTER ROOMS NUMBER:");
                num1 = scanner.nextInt();
                System.out.println("ENTER BASKETS NUMBER:");
                num2 = scanner.nextInt();
                System.out.println("ENTER CUSTOMERS NUMBER:");
                customers = scanner.nextInt()
                Demo.ROOMS = new int[num1];
                Demo.BASKETS = new int[num2];
       int number = 0;
       LinkedList<InThread> inThreadList = null;
                printInf(ROOMS,BASKETS);
          while(true) {

                Thread.sleep(getPoissonRandom(4000));
                number++;
                if(number>customers)
                     break;
                InThread inThread = new InThread(number);
                inThread.start();
          }
      }
```

Shared Variable

```
 public static void printInf(int[] ROOMS,int[] BASKETS) {

        System.out.println("ROOMS:");
        for(int num:ROOMS) {
              System.out.print(num + " ");
        }
        System.out.println();

        System.out.println("BASKETS:");
        for(int num:BASKETS) {
              System.out.print(num + " ");
        }
        System.out.println();
 }
public static int getPoissonRandom(double mean) {
      Random r = new Random();
 double L = Math.exp(-mean);

      int k = 0;
      double p = 1.0;

      do {
            p = p * r.nextDouble();
            k++;
      } while (p > L);
      return k - 1;
}
}
```

Poisson process 之作法

3. In Thread.java

```
 package os;
 import java.util.Random;
 import static os.Demo.printInf;
 public class InThread extends Thread {
        private boolean active;
        private int number;
        private int step;
        private int temp1;
```

```
        private int temp2;

    public InThread(int num) {
        active = true;
        number = num;
        step = 0;
    }

    public void setActive(boolean active) {
        this.active = active;
    }

    public boolean isActive() {
        return active;
    }
        static private Object obj = new Object();
        public static void staticWait() {
            synchronized (obj) {
            try {
                obj.wait();
            } catch (Exception e) { }
        }
    }

        public static void staticNotify() {
            synchronized (obj) {
                obj.notify();
            }
        }

    public static void leave(){
        Demo.basket--;
        staticNotify();
    }
    public void run () {
            while(Demo.basket > Demo.BASKETS.length-1){
System.out.println("No BASKET! NO."+ number +" SEND TO WAITLIST ");
            staticWait();
```

```
            }
            Demo.basket++;
   while(step<5) {
                switch(step) {
case 0:{
        System.out.println("NO."+ number + " Finding ROOM");
             for(int
avalivable=0;avalivable<Demo.ROOMS.length;avalivable++) {
                if(Demo.ROOMS[avalivable] == 0) {
                        Demo.ROOMS[avalivable] = number;
                        temp1 = avalivable+1;
                        step++;

                        System.out.println("USE NO."+ temp1 + " ROOM");
                                break;
                        }
                if(avalivable==Demo.ROOMS.length-1)
                     System.out.println("!!!NO Room for "+number+"!!!");
                        }
                        break;
                    }
 case 1:{
          System.out.println("No."+number + " Finding BASKET");
            for(int avalivable=0; avalivable<Demo.BASKETS.length;
avalivable++) {
                if(Demo.BASKETS[avalivable] == 0) {
                        Demo.BASKETS[avalivable] = number;
                        temp2 = avalivable+1;
                        Demo.ROOMS[temp1-1] = 0;
                        System.out.println("NO."+ temp1 + " ROOM
EMPTY");
                                step++
                        System.out.println("USE NO."+ temp2 + " BASKET");
                                break;
                         }
                if(avalivable==Demo.BASKETS.length-1)
                    System.out.println("!!!NO Basket for "+number+"!!!");
                        }
```

防止 Deadlock 機制

Critical Section

```
                    break;
                }
 case 2:{
            System.out.println("NO."+number + " SWIMMING");
                Step++
                break;
                }
case 3:{
            System.out.println("NO."+number + " Finding ROOM(2ND)");
              for(int i=0; i<Demo.ROOMS.length; i++) {
                if(Demo.ROOMS[i] == 0) {
                  Demo.ROOMS[i] = number;
                  temp1 = i+1;
                  step++;
            System.out.println("USE NO."+ temp1 + " ROOM");
                  Demo.BASKETS[temp2-1] = 0;
                  leave();

            System.out.println("NO."+ temp2 + " BASKET EMPTY");
                  break;
                        }
                if(i==Demo.ROOMS.length-1)
                System.out.println("!!!NO Room for "+number +"!!!");
                    }
                    break;
                }
  case 4:{
            System.out.println("NO."+ number + " LEAVE POOL");
            System.out.println("NO."+ temp1 + " ROOM EMPTY");
                tep++;
                Demo.ROOMS[temp1-1] = 0
                    break;
                }
              }
try {
               Thread.currentThread();
               Thread.sleep(Demo.getPoissonRandom(number+10)*300);
                }
```

```
        catch(InterruptedException e) {
                        e.printStackTrace();
                    }
                }
            }
        }
```

7. 參考資料及程式語言及編譯器

   1.github

   2.java

   3.netbeans