LAB_2

笔记本:	软件设计模式		
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LAB_2 Buy A Computer

- This is the experimental report of the **task 2**;

(一) Implementation method

1.1 Task analysis

- From the description of tasks, we can clearly feel that **three** design patterns can be used. They are **factory method pattern**, **decorator pattern** and **singleton pattern**. There are many entities in the task. We choose to analyze the relationship between them from the perspective of three design patterns.

1.1.1 Factory method pattern

- This is a typical factory pattern. Consumers buy computers from companies, and companies buy computer accessories from factories and assemble them according to customers' orders. All production activities are carried out in the factory, while Intel factory and Samsung factory only produce their own brand of CPU, motherboard and memory.
- Users have their own ideas about the composition of computers. He doesn't just go to the company to buy a mass-produced computer, so the company can't predict in advance which factory to buy the required accessories, so we exclude the possibility of using the simple factory pattern.

1.1.2 Decorator pattern

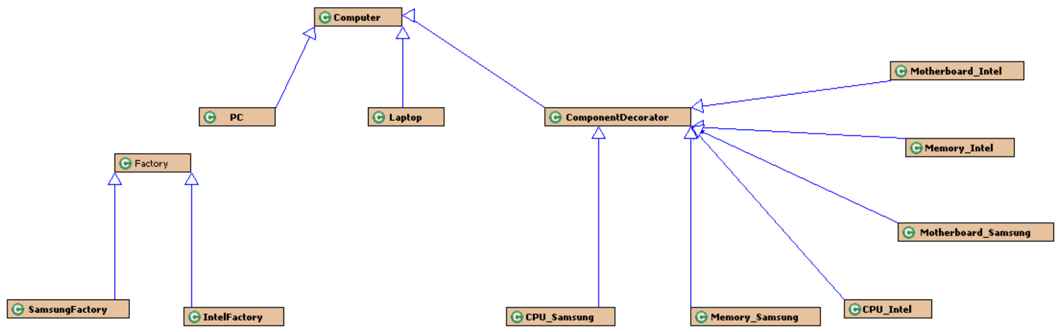
- A computer is like a bowl of rice. You have to add all kinds of ingredients to make it a dish. You can add a variety of CPUs and several blocks of memory.

What's more, after you have used your computer for a while, you may want to add a new CPU to improve its speed. In this case, each accessory has its own price. In order to get the final **cost** of an assembled computer, we use the decorator pattern. In this way, it is convenient to **add new functions on the basis of the original functions**.

1.1.3 Singleton pattern

- Each computer has a unique ID, which is easy to associate with singleton pattern. In order to prevent the ID of this computer from being modified by others, especially when multithreading, it is necessary to design a single idpool.. There are many government assigned IDs in the ID pool, and the qualified computer will get a unique ID.

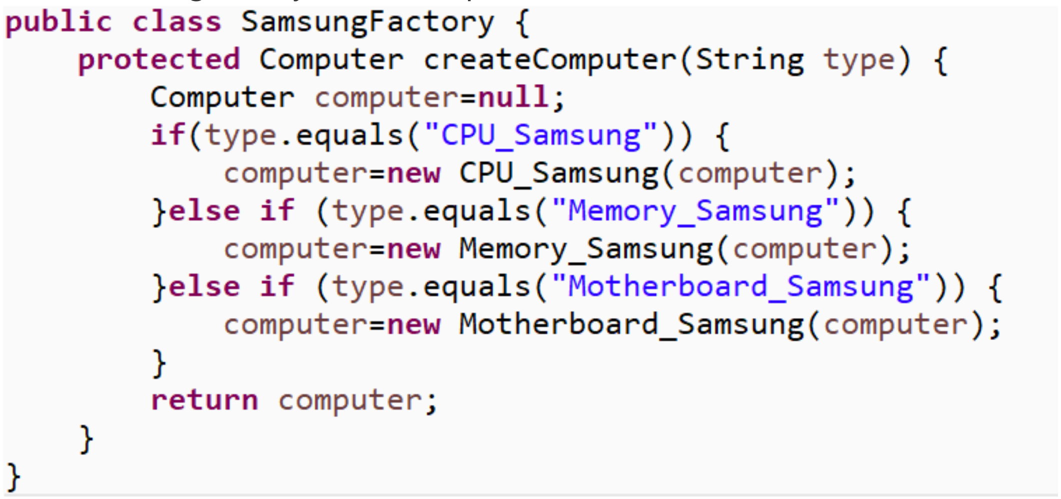
1.2 Design scheme(JAVA Edition)

- From the overall logic, customer, computer, company and government need to be created. The **computer class** is a key class, which is divided into PC and laptop, and consists of CPU, memory and motherboard.
- UML
- 

1.21 Factory method pattern

- There is no doubt that an abstract **factory** class is required. The only responsibility of the factory class is to produce computer accessories, which are specifically implemented by its subclasses **Intel factory** and **Samsung factory**

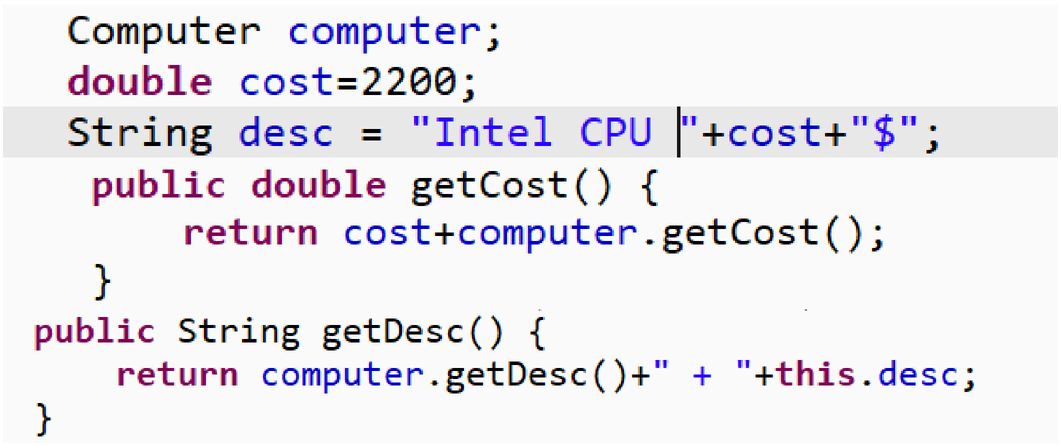
- (Take Samsung factory as an example)



```
public class SamsungFactory {
    protected Computer createComputer(String type) {
        Computer computer=null;
        if(type.equals("CPU_Samsung")) {
            computer=new CPU_Samsung(computer);
        }else if (type.equals("Memory_Samsung")) {
            computer=new Memory_Samsung(computer);
        }else if (type.equals("Motherboard_Samsung")) {
            computer=new Motherboard_Samsung(computer);
        }
        return computer;
    }
}
```

1.22 decorator pattern

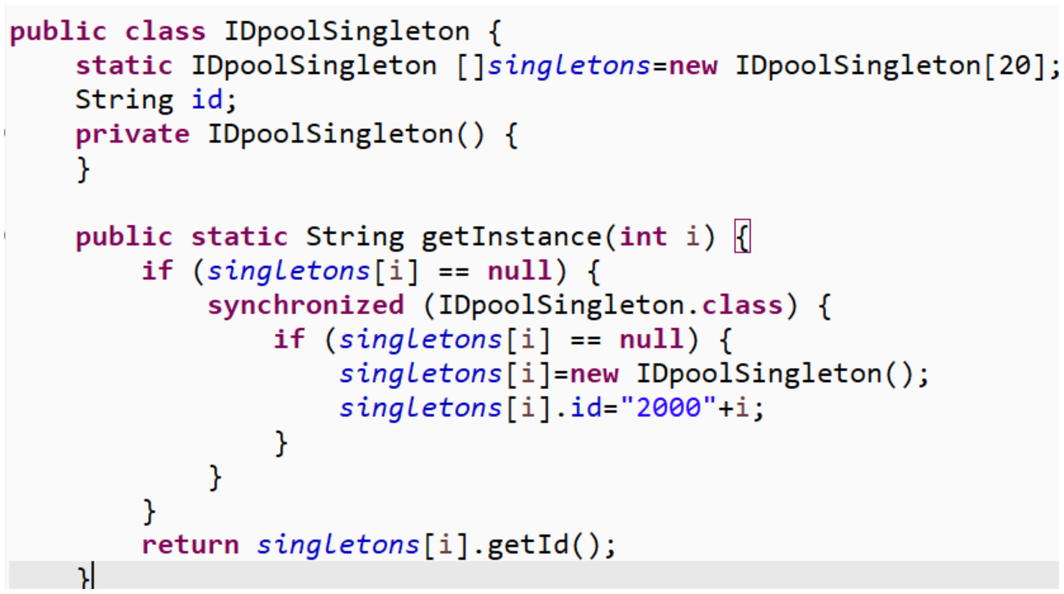
- First, we need a **computer** class, and two subclasses **PC** and **laptop**. In order to use the decorator pattern, we need to create another subclass **componentdecorator** class of the same level.
- It is worth noting that we implement the **getcost()** method and **getdesc()** method in each computer class to implement the decorator pattern.



```
   Computer computer;
   double cost=2200;
   String desc = "Intel CPU "+cost+"$";
    public double getCost() {
        return cost+computer.getCost();
    }
  public String getDesc() {
      return computer.getDesc()+" + "+this.desc;
  }
```

1.22 Singleton pattern

- An **idpoolsingleton** class is designed by double_check lock.
- This singleton class creates multiple instances and returns singletons based on the number passed in.

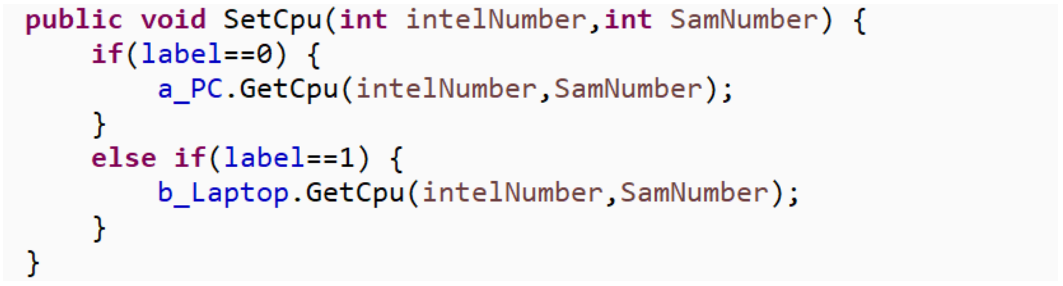


```java
public class IDpoolSingleton {
    static IDpoolSingleton []singletons=new IDpoolSingleton[20];
    String id;
    private IDpoolSingleton() {
    }

    public static String getInstance(int i) {
        if (singletons[i] == null) {
            synchronized (IDpoolSingleton.class) {
                if (singletons[i] == null) {
                    singletons[i]=new IDpoolSingleton();
                    singletons[i].id="2000"+i;
                }
            }
        }
        return singletons[i].getId();
    }
```

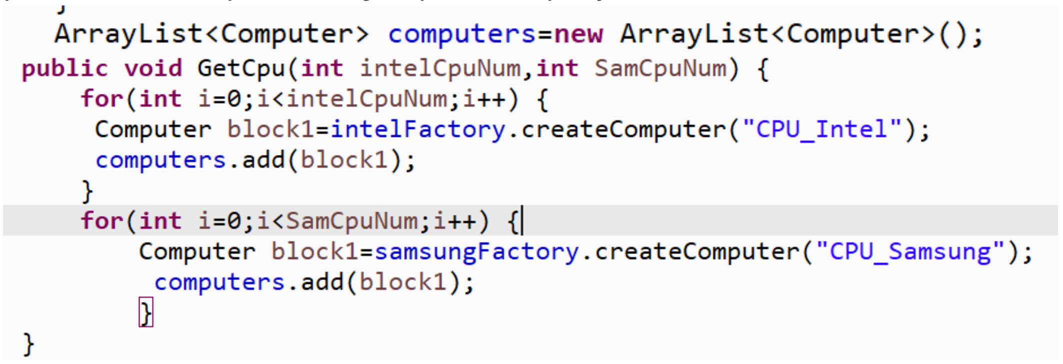
1.23 How to purchase a computer you need

- First, get the **number** of CPUs from different manufacturers, and judge whether it is used for PC or laptop.**The same** for other accessories



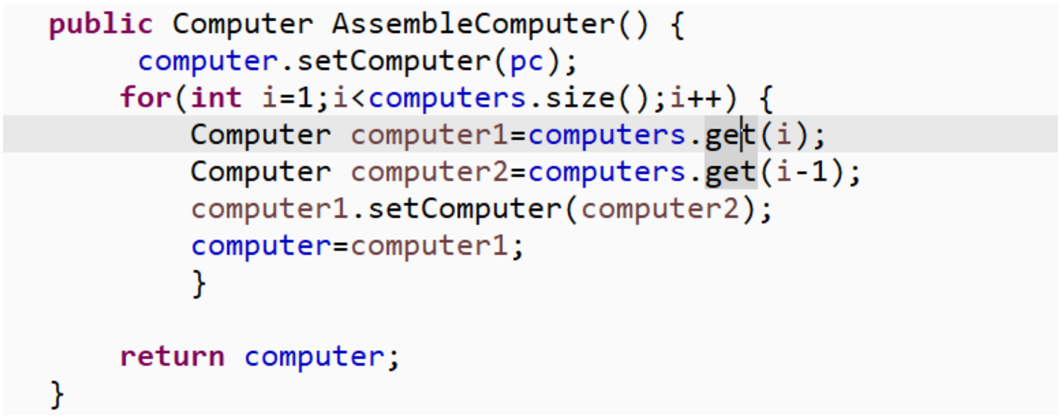
```java
public void SetCpu(int intelNumber,int SamNumber) {
    if(label==0) {
        a_PC.GetCpu(intelNumber,SamNumber);
    }
    else if(label==1) {
        b_Laptop.GetCpu(intelNumber,SamNumber);
    }
}
```

- Then in company a, we use the **factory pattern** to get the required CPU, and put it into a computer **array** kept in company A.



```java
  ArrayList<Computer> computers=new ArrayList<Computer>();
public void GetCpu(int intelCpuNum,int SamCpuNum) {
    for(int i=0;i<intelCpuNum;i++) {
     Computer block1=intelFactory.createComputer("CPU_Intel");
     computers.add(block1);
    }
    for(int i=0;i<SamCpuNum;i++) {
        Computer block1=samsungFactory.createComputer("CPU_Samsung");
         computers.add(block1);
        }
}
```

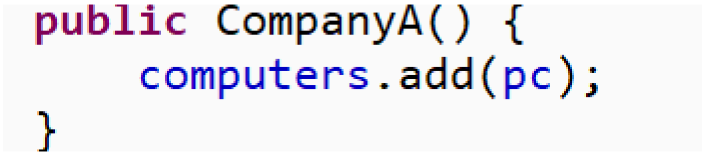
- Finally, after the customer **confirms** the purchase, assemble all the accessories in the company and use the **decorator pattern**.



```
public Computer AssembleComputer() {
      computer.setComputer(pc);
    for(int i=1;i<computers.size();i++) {
        Computer computer1=computers.get(i);
        Computer computer2=computers.get(i-1);
        computer1.setComputer(computer2);
        computer=computer1;
        }

    return computer;
}
```

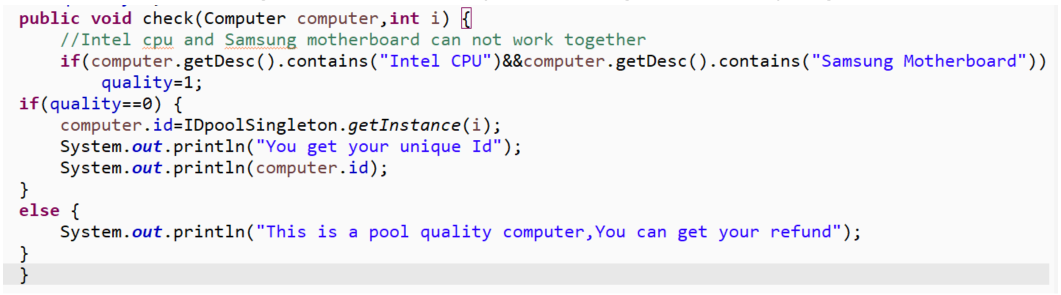
- Of course, the **PC itself** cannot be forgotten



```
public CompanyA() {
    computers.add(pc);
}
```

1.23 How to perform quality detection

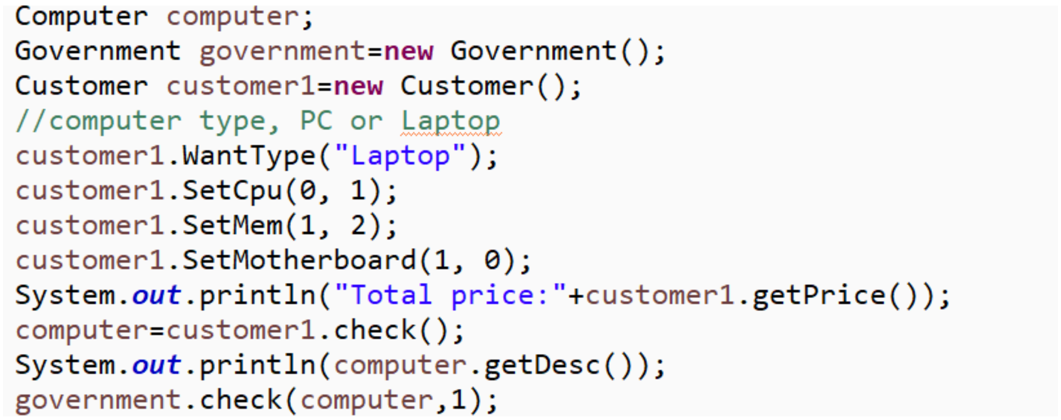
- The government tests every computer. Be careful. Some motherboards and CPUs can't work together. We simply use string character judgment here.



```
public void check(Computer computer,int i) {
    //Intel cpu and Samsung motherboard can not work together
    if(computer.getDesc().contains("Intel CPU")&&computer.getDesc().contains("Samsung Motherboard"))
        quality=1;
if(quality==0) {
    computer.id=IDpoolSingleton.getInstance(i);
    System.out.println("You get your unique Id");
    System.out.println(computer.id);
}
else {
    System.out.println("This is a pool quality computer,You can get your refund");
}
}
```

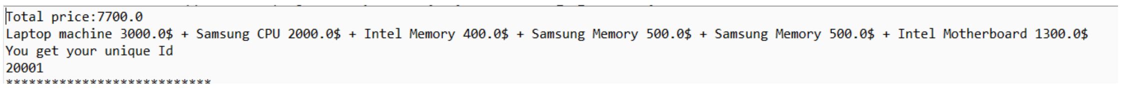
2.1 Experimental Result

1. **Step1:A qualified computer**
   Test code:



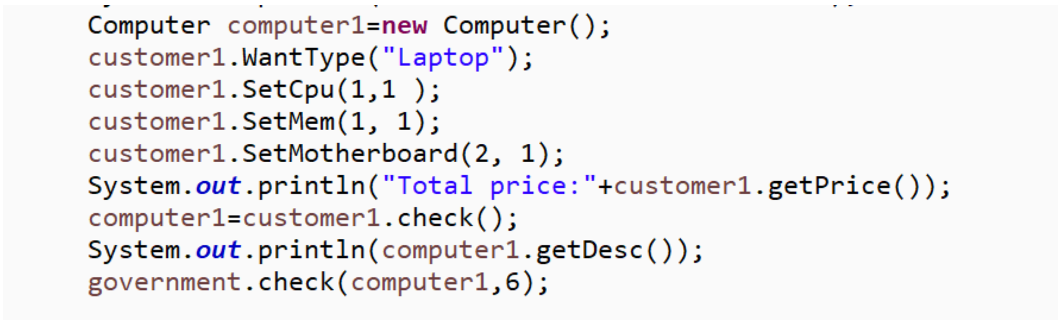
```
Computer computer;
Government government=new Government();
Customer customer1=new Customer();
//computer type, PC or Laptop
customer1.WantType("Laptop");
customer1.SetCpu(0, 1);
customer1.SetMem(1, 2);
customer1.SetMotherboard(1, 0);
System.out.println("Total price:"+customer1.getPrice());
computer=customer1.check();
System.out.println(computer.getDesc());
government.check(computer,1);
```

Result:

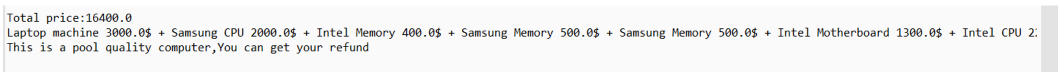


```
Total price:7700.0
Laptop machine 3000.0$ + Samsung CPU 2000.0$ + Intel Memory 400.0$ + Samsung Memory 500.0$ + Samsung Memory 500.0$ + Intel Motherboard 1300.0$
You get your unique Id
20001
***************************
```

1. **Step2: unqualified computer**



```
Computer computer1=new Computer();
customer1.WantType("Laptop");
customer1.SetCpu(1,1 );
customer1.SetMem(1, 1);
customer1.SetMotherboard(2, 1);
System.out.println("Total price:"+customer1.getPrice());
computer1=customer1.check();
System.out.println(computer1.getDesc());
government.check(computer1,6);
```



```
Total price:16400.0
Laptop machine 3000.0$ + Samsung CPU 2000.0$ + Intel Memory 400.0$ + Samsung Memory 500.0$ + Samsung Memory 500.0$ + Intel Motherboard 1300.0$ + Intel CPU 2
This is a pool quality computer,You can get your refund
```

3.1 Conclusion Analysis

3.11 Difficulties and key points

3.12 Group reflection

- This is the first time to complete a lab project in the form of a group. It is also a comprehensive use of various software design patterns. In the process of step-by-step analysis, we have a deeper understanding of the characteristics and use conditions of various modes. We can also learn a lot from group work. From the discussion in the analysis stage to the division of labor in the specific work, we have gained something hard to get from personal work.