成绩	

重庆邮电大学

实验报告

2020-2021 学年第 2 学期

计算机科学导论

（第 4 次试验）

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课程名称：计算机科学导论

实验时间：2021 年 4 月 29 日

实验地点：综合实验大楼 A511/A512

1 实验名称

Classes and Objects

2 实验目的

- Be able to declare a new class
- Be able to write a constructor
- Be able to write instance methods that return a value
- Be able to write instance methods that take arguments
- Be able to instantiate an object
- Be able to use calls to instance methods to access and change the state of an object

3 实验内容

Task#1 Creating a New Class

Define the Television class, with 2 constant fields and 3 remaining fields. And write comments for the class and each field.

Task #2 Writing a Constructor

Write the constructor of class, to initialize the Television object. It should take two parameters: brand and size, which should be set to constant fields. And initialize the television to be powered off, with current channel 2 and volume 20.

Task #3 Methods

Define 4 getter accessor methods to access all non-boolean fields. And define a setter mutator method to set current channel. Write a mutator power method to switch the power state. And a pair of mutator methods to increase and decrease the volume by 1. Write JavaDoc documentation for each method.

Task #4 Running the application

Concentrate the class we just written and TelevisionDemo.java. Then compile it and run.

Task #5 Creating another instance of a Television

Imitate the sample code in main method of TelevisionDemo class. Create another instance which is a 19-inch Sharp TV. And call some methods to do some stuff.

4 实验方法（原理、流程图）

The development environment is:

- OS: Ubuntu 20.04.2 LTS on Windows 10 (WSL1, Kernel build 19041)
- IDE/Editor: Visual Studio Code
- Java Runtime: OpenJDK 14.0.2 (build 14.0.2+12-Ubuntu-120.04)

For Task #1, we should define a class which should not be `public`. Because the field MANUFACTURER and field SCREEN_SIZE are constant, so they should be `final`. All fields are `private`.

For Task #2, the constructor should be accessed outside the class, so it should be `public`. And for a constructor it doesn't need a return type definition and it should have the same name as the class. It should do some initialization.

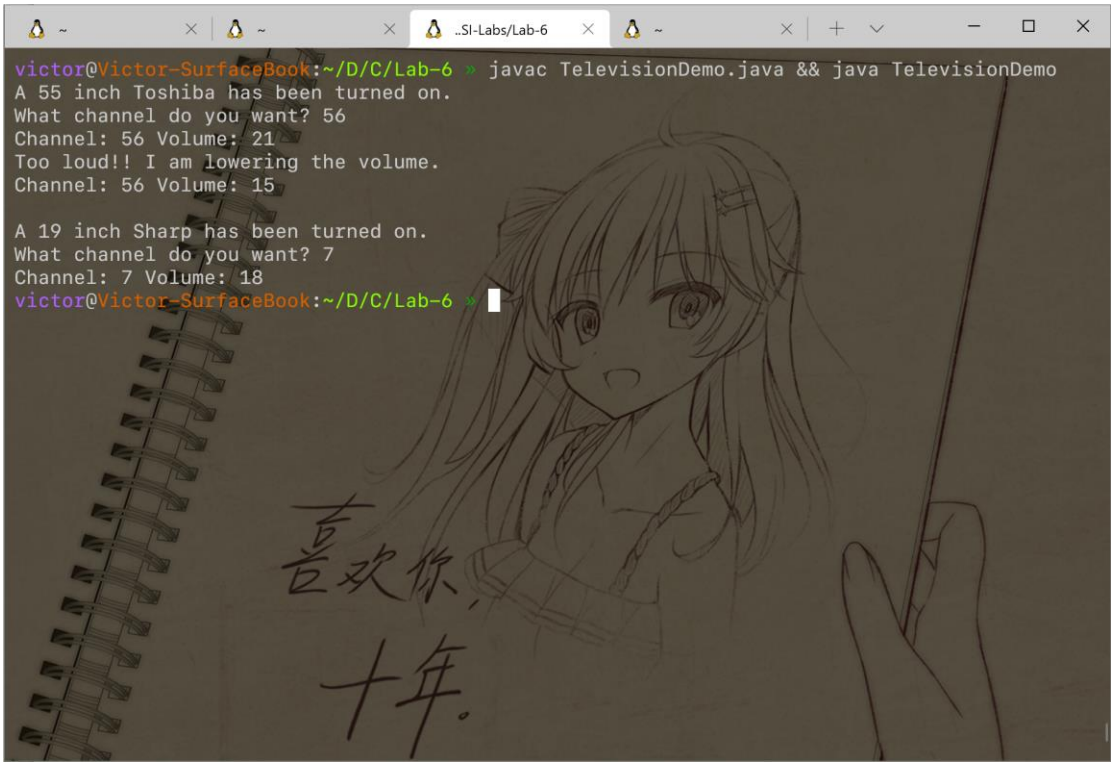
For Task #3, we should write some getters and a setter, which is really easy. For most cases, the intelligent IDE -- Visual Studio Code can automatically generate the getter and setter methods we need. Additionally, we need to write some custom mutator methods like switching power state and adjust volume. Really easy too. Note all of these methods should be `public` and should have JavaDoc documentation.

For Task #4, We should just copy the content of code listing 3.1 and paste it under our class, and then save it as `TelevisionDemo.java`. Note that the statement that displays the state of television has a bug. The method `getScreenSize()` returns an integer, not a string. So, the original statement outputs "A 55Toshiba has…". We should add "`+ "inch"`" after the place we call `getScreenSize()`.

For Task #5, we have to create another instance of Television called portable. And do something like the code above. Just declare a new variable "portable" typed Television, and assign it with new statement. Then we can imitate the code above such as turn on the power and set the channel we want.

5 实验结论

The lab has finished successfully. The program can completely achieve all goals. Here is the screenshot.



We have successfully implemented the Television class. For some details read the JavaDoc below.

字段

修饰符和类型	字段	说明
private int	channel	indicate the current channel
private java.lang.String	MANUFACTURER	store the brand of television
private boolean	powerOn	indicate if the television is on
private int	SCREEN_SIZE	store the screen size of television
private int	volume	indicate the current volume

构造器概要

构造器

构造器	说明
Television(java.lang.String brand, int size)	initialize the television instance, with volume 20 and channel 2, powered off.

方法概要

所有方法 **实例方法** **具体方法**

修饰符和类型	方法	说明
void	decreaseVolume()	decrease current volume by 1.
int	getChannel()	get current channel
java.lang.String	getManufacturer()	get the manufacturer of television
int	getScreenSize()	get the screen size of television
int	getVolume()	get current volume
void	increaseVolume()	increase current volume by 1.
void	power()	switch power state for television
void	setChannel(int station)	set the current channel of television

6 实验体会和收获

For an object-oriented programming language, classes and objects are the foundation. In this lab we learned how to use class to make abstraction of real-world objects. And by using private fields and getter/setter, we learned the idea of encapsulation, which hides the details and expose user-friendly interfaces to external.

7 程序代码

```
import java.util.Scanner;

/** The purpose of this class is to model a television
 * Huang Kaisheng <2020215138@stu.cqupt.edu.cn> - Apr. 29, 2021 */
class Television {
    /** store the brand of television */
    private final String MANUFACTURER;
    /** store the screen size of television */
    private final int SCREEN_SIZE;
    /** indicate if the television is on */
    private boolean powerOn;
    /** indicate the current channel */
    private int channel;
    /** indicate the current volume */
    private int volume;

    /**
     * initialize the television instance, with volume 20 and channel 2, powered off
.
     * @param brand the brand of television
     * @param size the size of television screen
     */
    public Television(String brand, int size) {
        this.MANUFACTURER = brand;
        this.SCREEN_SIZE = size;
        this.powerOn = false;
        this.volume = 20;
        this.channel = 2;
    }

    /**
     * get current volume
     * @return volume
     */
    public int getVolume() {
        return this.volume;
    }

    /**
     * get current channel
     * @return channel
     */
    public int getChannel() {
        return this.channel;
    }

    /**
     * get the manufacturer of television
     * @return manufacturer
     */
    public String getManufacturer() {
        return this.MANUFACTURER;
    }
```

```java
    /**
     * get the screen size of television
     * @return screen size
     */
    public int getScreenSize() {
        return this.SCREEN_SIZE;
    }
    /**
     * set the current channel of television
     * @param station the station to be set
     */
    public void setChannel(int station) {
        this.channel = station;
    }

    /**
     * switch power state for television
     */
    public void power() {
        this.powerOn = !(this.powerOn);
    }

    /**
     * increase current volume by 1.
     */
    public void increaseVolume() {
        this.volume++;
    }

    /**
     * decrease current volume by 1.
     */
    public void decreaseVolume() {
        this.volume--;
    }
}

/** This class demonstrates the Television class */
public class TelevisionDemo {
    public static void main(String[] args) {
        // create a Scanner object to read from the keyboard
        Scanner keyboard = new Scanner(System.in);

        // declare variables
        int station; // the user's channel choice

        // declare and instantiate a television object
        Television bigScreen = new Television("Toshiba", 55);
        // turn the power on
        bigScreen.power();
        // display the state of the television
        System.out.println("A " + bigScreen.getScreenSize() + " inch " + bigScreen.g
etManufacturer() + " has been turned on.");
        // prompt the user for input and store into station
        System.out.print("What channel do you want? ");
        station = keyboard.nextInt();

        // change the channel on the television
        bigScreen.setChannel(station);
        // increase the volume of the television
        bigScreen.increaseVolume();
        // display the the current channel and volume of the television
        System.out.println("Channel: " + bigScreen.getChannel() + " Volume: " + bigS
creen.getVolume());
        System.out.println("Too loud!! I am lowering the volume.");
        // decrease the volume of the television
        bigScreen.decreaseVolume();
        bigScreen.decreaseVolume();
```

```
        bigScreen.decreaseVolume();
        bigScreen.decreaseVolume();
        bigScreen.decreaseVolume();
        bigScreen.decreaseVolume();
        // display the current channel and volume of the television
        System.out.println("Channel: " + bigScreen.getChannel() + " Volume: " + bigS
creen.getVolume());
        System.out.println(); // for a blank line
        // HERE IS WHERE YOU DO TASK #5
        Television portable = new Television("Sharp", 19);
        portable.power();
        System.out.println("A " + portable.getScreenSize() + " inch " + portable.get
Manufacturer() + " has been turned on.");
        System.out.print("What channel do you want? ");
        station = keyboard.nextInt();
        portable.setChannel(station);
        portable.decreaseVolume();
        portable.decreaseVolume();
        System.out.println("Channel: " + portable.getChannel() + " Volume: " + porta
ble.getVolume());
    }
}
```