

ĐẠI HỌC BÁCH KHOA HÀ NỘI
TRƯỜNG CÔNG NGHỆ THÔNG TIN VÀ TRUYỀN THÔNG

BÁO CÁO THỰC HÀNH
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BÁO CÁO THỰC HÀNH LAB 03

THỰC HÀNH LẬP TRÌNH HƯỚNG ĐỐI TƯỢNG

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1. Working with method overloading

1.1. Overloading by differing types of parameter

Code

```
public void addDigitalVideoDisc(DigitalVideoDisc[] dvdList){
    for(int i=0; i<dvdList.length; i++){
        if (qtyOrdered < MAX_NUMBER_ORDERED) {
            itemsOrdered[qtyOrdered] = dvdList[i];
            qtyOrdered++;
            System.out.println("them thanh cong" + dvdList[i].getTitle());
        } else
            System.out.println("gio hang day ko them duoc");
    }
}
```

Figure 1 Method addDigitalVideoDisc(DigitalVideoDisc [] dvdList)

```
// Nguyen Thanh Vinh 20225779
public class AIMS {
    Run | Debug
    public static void main(String[] args) {
        Cart anOrder = new Cart();

        DigitalVideoDisc[] dvdList = new DigitalVideoDisc[3];
        dvdList[0] = new DigitalVideoDisc(title:"the Lion King", category:"Animation", directory:"Roger Allers", length:87, cost:19.95f);

        dvdList[1] = new DigitalVideoDisc(title:"Star Wars", category:"Science Fiction", directory:"George Lucas", length:87, cost:24.95f);

        dvdList[2] = new DigitalVideoDisc(title:"Aladin", category:"Animation", cost:18.99f);

        anOrder.addDigitalVideoDisc(dvdList);
        System.out.println("total cost is :" + anOrder.totalCost());
    }
}
```

Figure 2 Aims Class

Result

```
them thanh cong the Lion King
them thanh cong Star Wars
them thanh cong Aladin
total cost is :63.89
```

Figure 3 Result

1.2. Overloading by differing the number of parameters

Code

```
public void addDigitalVideoDisc(DigitalVideoDisc dvd1, DigitalVideoDisc dvd2){
    if (qtyOrdered < MAX_NUMBER_ORDERED) {
        itemsOrdered[qtyOrdered] = dvd1;
        qtyOrdered++;
        System.out.println("them thanh cong " + dvd1.getTitle());
    } else
        System.out.println(x:"gio hang day ko them duoc");

    if (qtyOrdered < MAX_NUMBER_ORDERED) {
        itemsOrdered[qtyOrdered] = dvd2;
        qtyOrdered++;
        System.out.println("them thanh cong " + dvd2.getTitle());
    } else
        System.out.println(x:"gio hang day ko them duoc");
}
```

Figure 4 Method addDigitalVideoDisc(DigitalVideoDisc dvd1, DigitalVideoDisc dvd2)

```
// Nguyen Thanh Vinh 20225779
public class AIMS {
    Run | Debug
    public static void main(String[] args) {
        Cart anOrder = new Cart();

        DigitalVideoDisc[] dvdList = new DigitalVideoDisc[3];
        dvdList[0] = new DigitalVideoDisc(title:"the Lion King", category:"Animation", directory:"Roger Allers", length:87, cost:19.95f);

        dvdList[1] = new DigitalVideoDisc(title:"Star Wars", category:"Science Fiction", directory:"George Lucas", length:87, cost:24.95f);

        dvdList[2] = new DigitalVideoDisc(title:"Aladin", category:"Animation", cost:18.99f);
        DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"the Lion King", category:"Animation", directory:"Roger Allers", length:87, cost:19.95f);
        DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars", category:"Science Fiction", directory:"George Lucas", length:87, cost:24.95f);
        anOrder.addDigitalVideoDisc(dvd1, dvd2);
        System.out.println("total cost is :" + anOrder.totalCost());
    }
}
```

Figure 5 Aims Class

Result

```
them thanh cong the Lion King
them thanh cong Star Wars
total cost is :44.9
```

Figure 6 Result

2. Passing parameter

Code

```
// Nguyen Thanh Vinh 20225779
public class TestPassingParameter {
    Run | Debug
    public static void main(String[] args){
        DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
        DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");

        swap(jungleDVD, cinderellaDVD);
        System.out.println("Jungle dvd title: " + jungleDVD.getTitle());
        System.out.println("Cinderella dvd title: " + cinderellaDVD.getTitle());

        changeTitle(jungleDVD, cinderellaDVD.getTitle());
        System.out.println("Jungle dvd title: " + jungleDVD.getTitle());
    }
    public static void swap(Object o1, Object o2){
        Object tmp = o1;
        o1 = o2;
        o2 = tmp;
    }
    public static void changeTitle(DigitalVideoDisc dvd, String title){
        String oldTitle = dvd.getTitle();
        dvd.setTitle(title);
        dvd = new DigitalVideoDisc(oldTitle);
    }
}
```

Figure 7 Passing parameter code

Result

```
Jungle dvd title: Jungle
Cinderella dvd title: Cinderella
Jungle dvd title: Cinderella
```

Figure 8 Passing parameter result

3. Class Member and Instance Member

Code

```
private static int nbDigitalVideoDiscs = 0;
private int id;
```

Figure 9 Class member and Instance member

Result

```
1 // Nguyen Thanh Vinh 20225779
2 public class AIMS {
3     Run | Debug
4     public static void main(String[] args) {
5         Cart anOrder = new Cart();
6         DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"the Lion King", category:"Animation", directory:"Roger Allers", length:87, cost:19.95f);
7         DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars", category:"Science Fiction", directory:"George Lucas", length:87, cost:24.95f);
8         DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"Aladin", category:"Animation", cost:18.99f);
9         anOrder.addDigitalVideoDisc(dvd1, dvd2);
10        System.out.println("id cua " + dvd1.getTitle() + " la " + dvd1.getId());
11    }
12 }
```

PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS

[Running] cd "c:\Users\vinh1\Desktop\OOP\IT3103.744529.2024.1.20225779.NguyenThanhVinh\LAB02\" && javac AIMS.java && java AIMS

them thanh cong the Lion King
them thanh cong Star Wars
id cua the Lion King la 1

Figure 10 Result

4. Open the Cart class

Code

```
public void print() {
    System.out.println(x:"*****CART*****");
    System.out.println(x:"Ordered Items:");

    for (int i = 0; i < qtyOrdered; i++) {
        System.out.println((i + 1) + ". " + "DVD - " + itemsOrdered[i].toString());
    }

    System.out.println("Total cost: " + totalCost() + " $");
    System.out.println(x:"*****");
}
```

Figure 11 Code method to print the content in Cart

```
public void displaySearchResultById(int id) {
    DigitalVideoDisc result = searchById(id);
    if (result != null) {
        System.out.println("DVD found: " + result.toString());
    } else {
        System.out.println("No DVD with ID " + id + " found in the cart.");
    }
}
```

Figure 12 Code method search by id

```
public DigitalVideoDisc searchByTitle(String title) {
    for (int i = 0; i < qtyOrdered; i++) {
        if (itemsOrdered[i].isMatch(title)) {
            return itemsOrdered[i];
        }
    }
    return null;
}

public void displaySearchResultByTitle(String title) {
    DigitalVideoDisc result = searchByTitle(title);
    if (result != null) {
        System.out.println("DVD found: " + result.toString());
    } else {
        System.out.println("No DVD with title \"" + title + "\" found in the cart.");
    }
}
```

Figure 13 Code method search by title

```
public boolean isMatch(String title) {
    return this.title.equalsIgnoreCase(title);
}
```

Figure 14 IsMatch() in DigitalVideoDisc class

```

public class cartTest {
    Run | Debug
    public static void main(String[] args) {
        Cart cart = new Cart();
        DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"the Lion King", category:"Animation", directory:"Roger Allers", length:87, cost:19.95f);
        cart.addDigitalVideoDisc(dvd1);
        DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars", category:"Science Fiction", directory:"George Lucas", length:87, cost:24.95f);
        cart.addDigitalVideoDisc(dvd2);
        DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"Aladin", category:"Animation", cost:18.99f);
        cart.addDigitalVideoDisc(dvd3);

        cart.print();

        System.out.println(x:"Search by ID:");
        cart.displaySearchResultById(id:1);
        cart.displaySearchResultById(id:4);

        System.out.println(x:"\nSearch by Title:");
        cart.displaySearchResultByTitle(title:"The Lion King");
        cart.displaySearchResultByTitle(title:"Frozen");
    }
}

```

Figure 15 CartTest class

Result

```

them thanh cong
them thanh cong
them thanh cong
*****CART*****
Ordered Items:
1. DVD - DVD - the Lion King - Animation - Roger Allers - 87 - 19.95 $
2. DVD - DVD - Star Wars - Science Fiction - George Lucas - 87 - 24.95 $
3. DVD - DVD - Aladin - Animation - null - 0 - 18.99 $
Total cost: 63.89 $
*****
Search by ID:
DVD found: DVD - the Lion King - Animation - Roger Allers - 87 - 19.95 $
No DVD with ID 4 found in the cart.

Search by Title:
DVD found: DVD - the Lion King - Animation - Roger Allers - 87 - 19.95 $
No DVD with title "Frozen" found in the cart.

```

Figure 16 Result

5. Implement the Store class

Code

```
public class Store {
    private static final int MAX_STORE_CAPACITY = 100;
    private DigitalVideoDisc[] itemsInStore = new DigitalVideoDisc[MAX_STORE_CAPACITY];
    private int qtyInStore = 0;

    public void addDVD(DigitalVideoDisc dvd) {
        if (qtyInStore < MAX_STORE_CAPACITY) {
            itemsInStore[qtyInStore] = dvd;
            qtyInStore++;
            System.out.println("Added DVD: " + dvd.getTitle());
        } else {
            System.out.println(x:"Store is full. Cannot add more DVDs.");
        }
    }

    public void removeDVD(String title) {
        for (int i = 0; i < qtyInStore; i++) {
            if (itemsInStore[i].isMatch(title)) {
                for (int j = i; j < qtyInStore - 1; j++) {
                    itemsInStore[j] = itemsInStore[j + 1];
                }
                itemsInStore[qtyInStore - 1] = null;
                qtyInStore--;
                System.out.println("Removed DVD: " + title);
                return;
            }
        }
        System.out.println("DVD with title \"" + title + "\" not found in store.");
    }

    public void printStore() {
        System.out.println(x:"*****STORE*****");
        for (int i = 0; i < qtyInStore; i++) {
            System.out.println((i + 1) + ". " + itemsInStore[i].toString());
        }
        System.out.println(x:"*****");
    }
}
```

Figure 17 Store Class

```

public class StoreTest {
    Run | Debug
    public static void main(String[] args) {
        Store store = new Store();

        DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"The Lion King", category:"Animation", directory:"Roger Allers", length:87, cost:19.95f);
        DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars", category:"Science Fiction", directory:"George Lucas", length:87, cost:24.95f);
        DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"Aladdin", category:"Animation", cost:18.99f);

        store.addDVD(dvd1);
        store.addDVD(dvd2);
        store.addDVD(dvd3);

        System.out.println(x:"\nStore inventory after adding DVDs:");
        store.printStore();

        store.removeDVD(title:"Star Wars");
        System.out.println(x:"\nStore inventory after removing 'Star Wars':");
        store.printStore();

        store.removeDVD(title:"Frozen");
    }
}

```

Figure 18 StoreTest class

Result

```

Added DVD: The Lion King
Added DVD: Star Wars
Added DVD: Aladdin

Store inventory after adding DVDs:
*****STORE*****
1. DVD - The Lion King - Animation - Roger Allers - 87 - 19.95 $
2. DVD - Star Wars - Science Fiction - George Lucas - 87 - 24.95 $
3. DVD - Aladdin - Animation - null - 0 - 18.99 $
*****

Removed DVD: Star Wars

Store inventory after removing 'Star Wars':
*****STORE*****
1. DVD - The Lion King - Animation - Roger Allers - 87 - 19.95 $
2. DVD - Aladdin - Animation - null - 0 - 18.99 $
*****

DVD with title "Frozen" not found in store.

```

Figure 19 Result

6. String, StringBuilder and StringBuffer

Code

```
public class ConcatenationInLoops {  
    Run | Debug  
    public static void main(String[] args) {  
        Random r = new Random(123);  
        long start = System.currentTimeMillis();  
        String s = "";  
        for (int i = 0; i < 65536; i++)  
            s += r.nextInt(2);  
        System.out.println(System.currentTimeMillis() - start);  
  
        r = new Random(123);  
        start = System.currentTimeMillis();  
        StringBuilder sb = new StringBuilder();  
        for (int i = 0; i < 65536; i++)  
            sb.append(r.nextInt(2));  
        s = sb.toString();  
        System.out.println(System.currentTimeMillis() - start);  
    }  
}
```

Figure 20 So sánh String và StringBuilder

Result

```
public class GarbageCreator {  
    Run | Debug  
    public static void main(String[] args) {  
        for (int i = 0; i < 100000; i++) {  
            String s = "garbage" + i;  
        }  
    }  
}
```

Figure 21 GarbageCreator class

```
[Running] cd "c:\Users\vinh1\Desktop\OOP\IT3103.744529.2024.1.20225779.NguyenThanhVinh\Lab03\" && javac GarbageCreator.java && java GarbageCreator
42
```

Figure 22 Result: program hangs

```
public class NoGarbage {
    Run | Debug
    public static void main(String[] args) {
        long start = System.currentTimeMillis();
        StringBuilder sb = new StringBuilder();
        for (int i = 0; i < 100000; i++) {
            sb.append(str:"garbage");
        }
        System.out.println(System.currentTimeMillis() - start);
    }
}
```

Figure 23 NoGarbage class

```
[Running] cd "c:\Users\vinh1\Desktop\OOP\IT3103.744529.2024.1.20225779.NguyenThanhVinh\Lab03\" && javac NoGarbage.java && java NoGarbage
6
```

Figure 24 Result: Program finishes quickly

7 Class Diagram

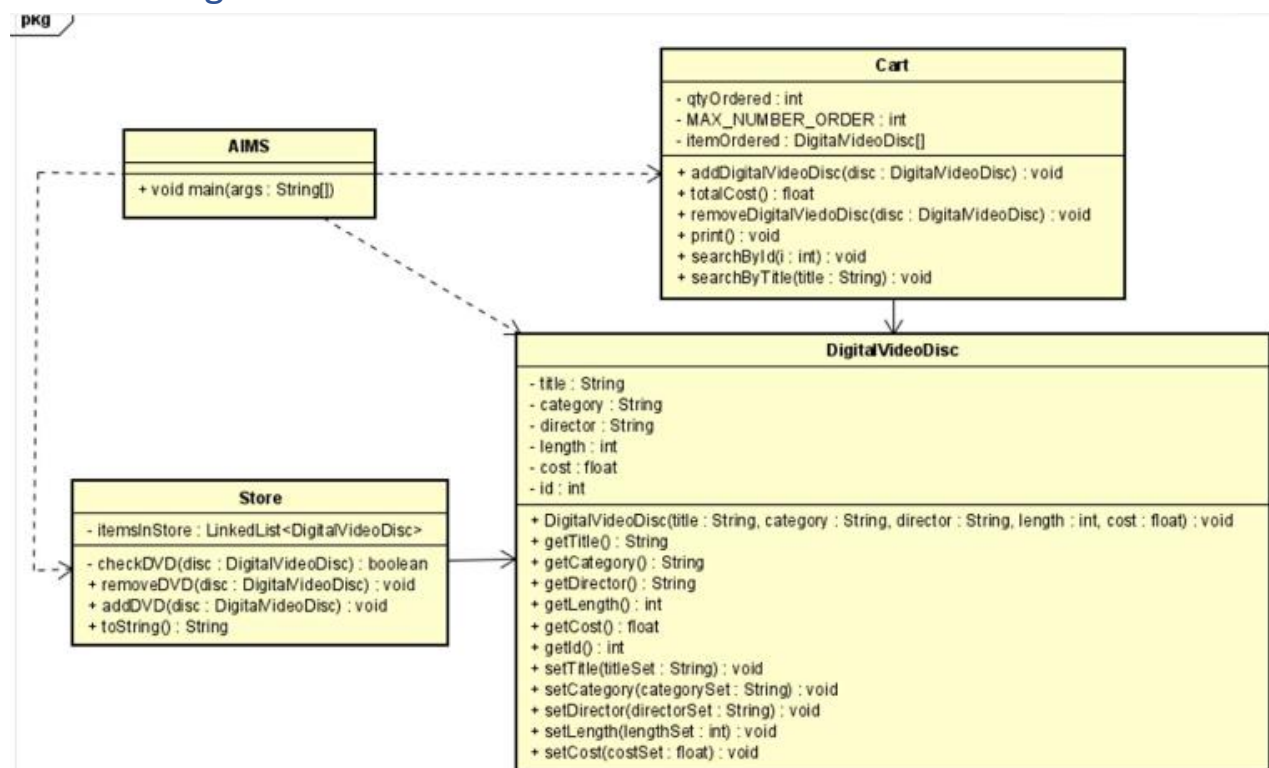


Figure 25 Class Diagram

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