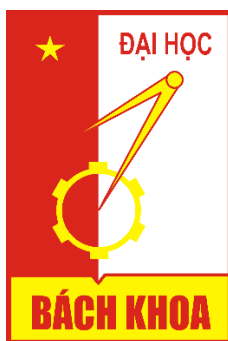


ĐẠI HỌC BÁCH KHOA HÀ NỘI
TRƯỜNG CÔNG NGHỆ THÔNG TIN VÀ TRUYỀN THÔNG



BÁO CÁO THỰC HÀNH
IT3103 – 744528 - 2024.1
BÀI THỰC HÀNH 4

Họ và tên sinh viên: Phạm Duy Đông

MSSV: 20225608

Lớp: Việt Nhật 05 – K67

GVHD: Lê Thị Hoa

HTGD: Đặng Mạnh Cường

Hà Nội 12/2024

BÁO CÁO THỰC HÀNH LAB 4

LẬP TRÌNH HƯỚNG ĐỐI TƯỢNG

Mục lục nội dung

1. Create the Book class	6
2. Creating the abstract Media class	8
3. Creating the CompactDisc class	13
3.1. Create the Disc class extending the Media class.....	13
3.2. Create the Track class	15
3.3. Open the CompactDisc class	16
4. Create the Playable interface	17
5. Update the Cart class to work with Media	20
6. Update the Store class to work with Media	22
7. Constructors of whole classes and parent classes	23
8. Unique item in a list	25
9. Polymorphism with toString() method	25
10. Sort media in the cart	27
11. Create a complete console application in the Aims class.....	30
11.1. View store	31
11.1.1. See a media's details	31
11.1.2. Add a media to cart.....	32
11.1.3. Play a media	32
11.1.4. See current cart	33
11.2. Update store	33
11.2.1. Add a media	33
11.2.2. Remove a media	34
11.3. See current cart.....	34
11.3.1. Filter medias in cart	35
11.3.2. Sort medias in cart.....	36
11.3.3. Remove media from cart	37
11.3.4. Play a media	38

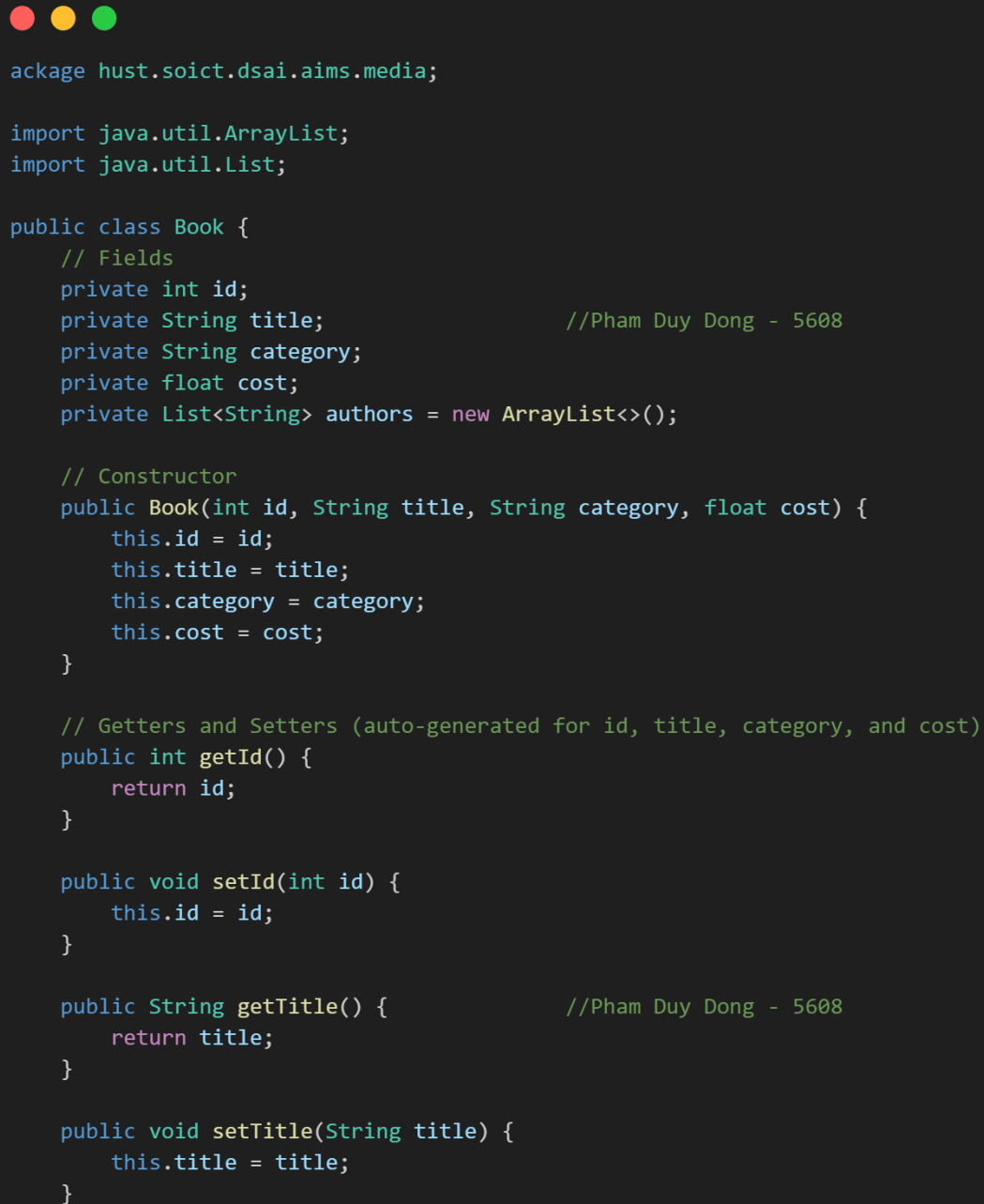
11.3.5.	Place order	38
12.	Class Diagram.....	40
13.	UseCase Diagram	41

Mục lục hình ảnh

Hình 1: Book Class 1	6
Hình 2: Book Class 2	7
Hình 3: Media Class 1.....	8
Hình 4: Media Class 2.....	9
Hình 5: Book Class extends Media	10
Hình 6: DigitalVideoDisc Class extends Media 1	11
Hình 7: DigitalVideoDisc Class extends Media 2	12
Hình 8: Disc Class.....	13
Hình 9: DigitalVideoDisc Class extends Disc	14
Hình 10: CompactDisc Class extends Disc	14
Hình 11: Track Class	15
Hình 12: CompactDisc Class using Track.....	16
Hình 13: Method getLength of CompactDisc	16
Hình 14: Playable interface.....	17
Hình 15: Implement the Playable with CompactDisc	17
Hình 16: Implement the Playable with DigitalVideoDisc	18
Hình 17: Implement the Playable with Track.....	18
Hình 18: Implement play() for DigitalVideoDisc	18
Hình 19: Implement play() for Track	19
Hình 20: Implement play() for CompactDisc.....	19
Hình 21: Update the Cart class to work with Media 1	20
Hình 22: Update the Cart class to work with Media 2	21
Hình 23: Update the Store class to work with Media	22
Hình 24: Constructor of Track.....	23
Hình 25: Constructor of CompactDisc	23
Hình 26: Constructor of Media	23
Hình 27: Constructor of Disc	24
Hình 28: Override equals in Media class.....	25
Hình 29: Override equals in Track class.....	25
Hình 30: Override toString in Media Class	25
Hình 31: Sample code for Polymorphism	26
Hình 32: Result of Polymorphism.....	27
Hình 33: Media Comparator by title-cost.....	27
Hình 34: Media Comparator by cost-title.....	28
Hình 35: Add two Comparators to Media	28
Hình 36: Sample code for Sorting media in cart	29
Hình 37: Result of sorting	30
Hình 38: Main menu	30
Hình 39: View store menu.....	31
Hình 40: See a media's details.....	31
Hình 41: Add a media to cart.....	32
Hình 42: Play a media.....	32
Hình 43: See current cart.....	33

Hình 44: Update store menu	33
Hình 45: Add a media	34
Hình 46: Remove a media	34
Hình 47: See current cart.....	34
Hình 48: Filter by ID	35
Hình 49: Filter by title	35
Hình 50: Sort by title	36
Hình 51: Sort by cost	36
Hình 52: Remove media from cart.....	37
Hình 53: Result of remove media from cart	37
Hình 54: Play a media	38
Hình 55: Place order	38
Hình 56: Result of Place order	39
Hình 57: Class Diagram.....	40
Hình 58: UseCase Diagram.....	41

1. Create the Book class



```
package hust.soict.dsai.aims.media;

import java.util.ArrayList;
import java.util.List;

public class Book {
    // Fields
    private int id;
    private String title;           //Pham Duy Dong - 5608
    private String category;
    private float cost;
    private List<String> authors = new ArrayList<>();

    // Constructor
    public Book(int id, String title, String category, float cost) {
        this.id = id;
        this.title = title;
        this.category = category;
        this.cost = cost;
    }

    // Getters and Setters (auto-generated for id, title, category, and cost)
    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }

    public String getTitle() {      //Pham Duy Dong - 5608
        return title;
    }

    public void setTitle(String title) {
        this.title = title;
    }
}
```

Hình 1: Book Class 1

```
public String getCategory() {
    return category;
}

public void setCategory(String category) {
    this.category = category;
}

public float getCost() {
    return cost;
}

public void setCost(float cost) {
    this.cost = cost;
}

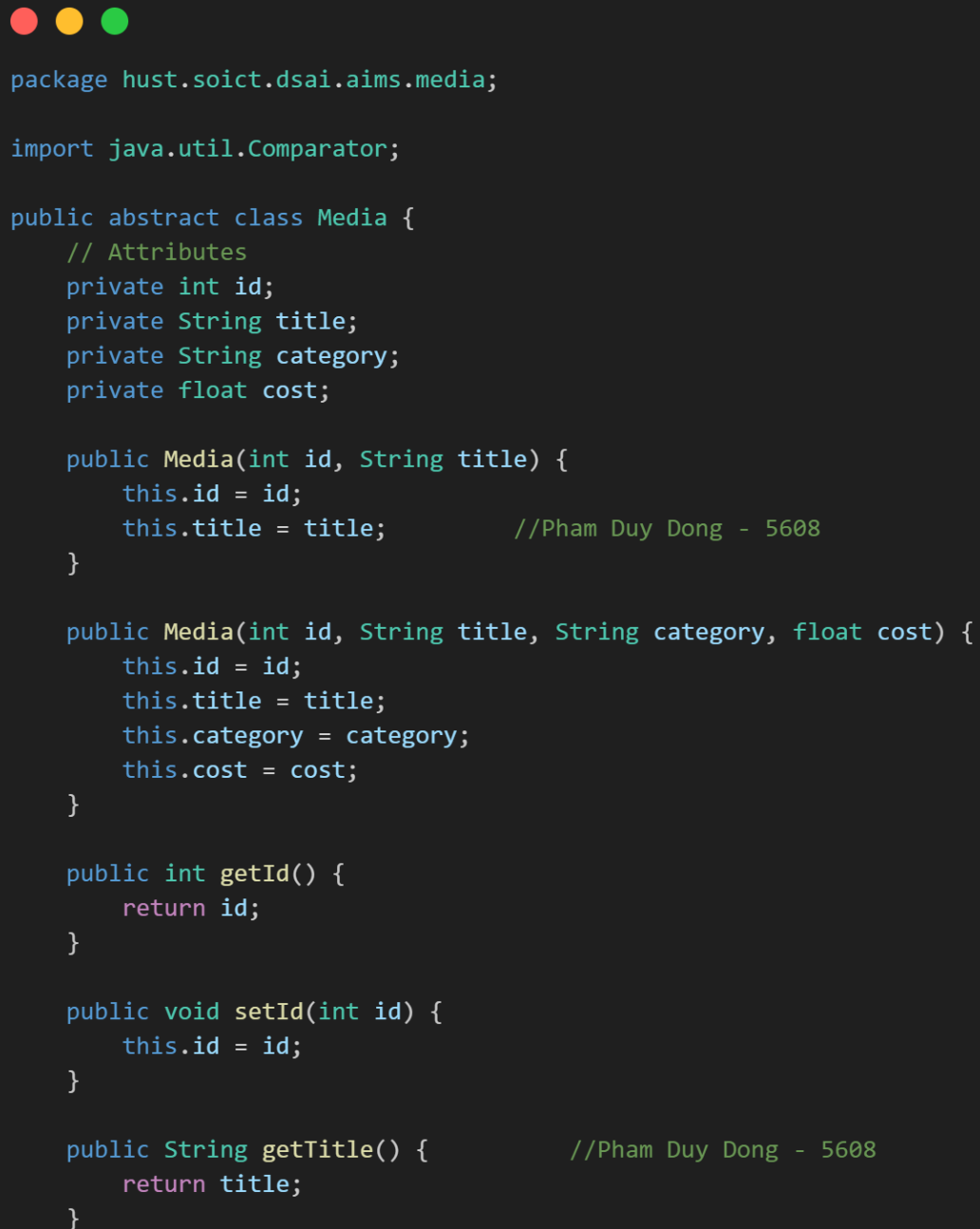
// Method to add an author
public void addAuthor(String authorName) {
    if (authors.contains(authorName)) {
        System.out.println("Pham Duy Dong - 5608 - Author is already in the list");
    } else {
        authors.add(authorName);
        System.out.println("Pham Duy Dong - 5608 - Added author successfully");
    }
}

// Method to remove an author
public void removeAuthor(String authorName) {
    if (!authors.contains(authorName)) {
        System.out.println("Pham Duy Dong - 5608 - Author is not in the list");
    } else {
        authors.remove(authorName);
        System.out.println("Pham Duy Dong - 5608 - Removed author successfully");
    }
}

public List<String> getAuthors() {
    return authors;
}
}
```

Hình 2: Book Class 2

2. Creating the abstract Media class



```
package hust.soict.dsai.aims.media;

import java.util.Comparator;

public abstract class Media {
    // Attributes
    private int id;
    private String title;
    private String category;
    private float cost;

    public Media(int id, String title) {
        this.id = id;
        this.title = title;          //Pham Duy Dong - 5608
    }

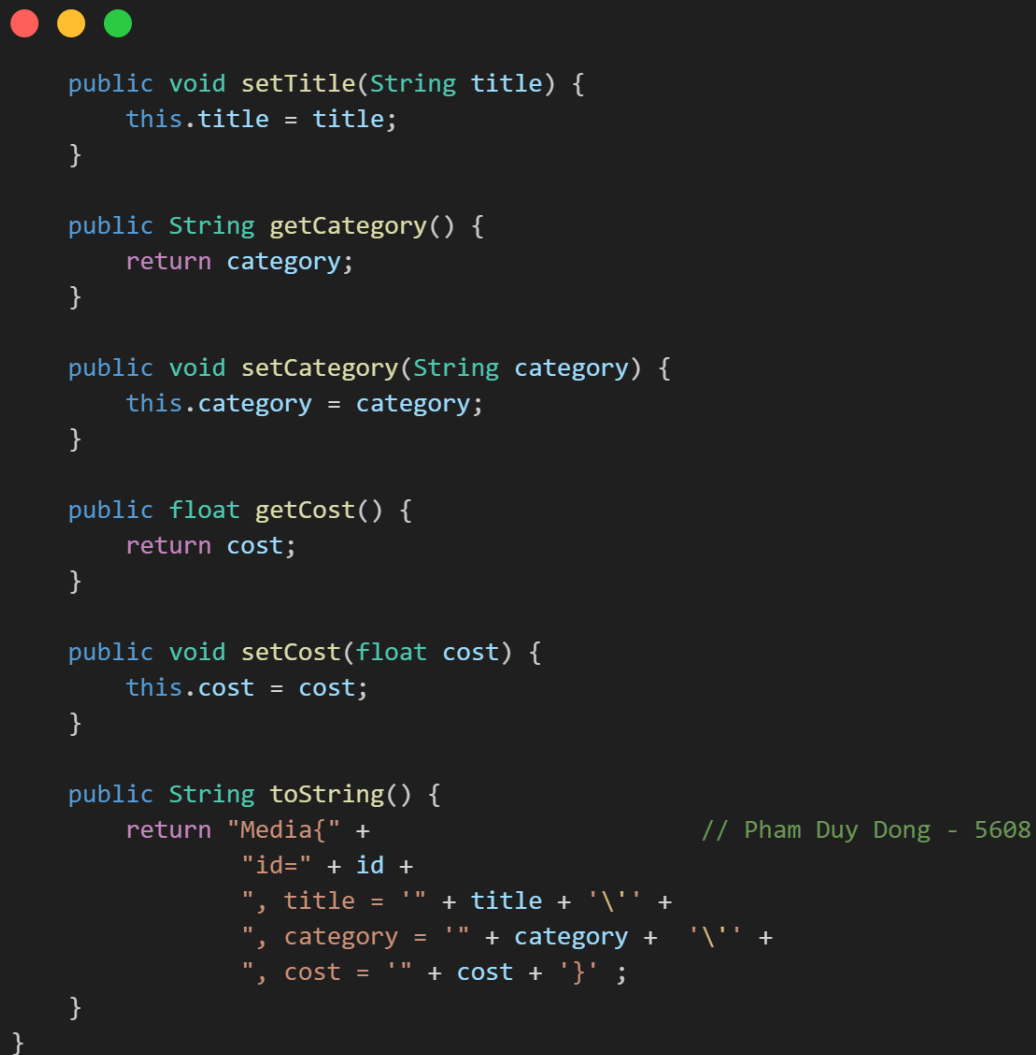
    public Media(int id, String title, String category, float cost) {
        this.id = id;
        this.title = title;
        this.category = category;
        this.cost = cost;
    }

    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }

    public String getTitle() {          //Pham Duy Dong - 5608
        return title;
    }
}
```

Hình 3: Media Class 1



```
public void setTitle(String title) {
    this.title = title;
}

public String getCategory() {
    return category;
}

public void setCategory(String category) {
    this.category = category;
}

public float getCost() {
    return cost;
}

public void setCost(float cost) {
    this.cost = cost;
}

public String toString() {
    return "Media{" +
        "id=" + id +
        ", title = '" + title + '\'' +
        ", category = '" + category + '\'' +
        ", cost = '" + cost + '\'' ;
}
}
```

Hình 4: Media Class 2

```
package hust.soict.dsai.aims.media;

import java.util.ArrayList;
import java.util.List;

public class Book extends Media {
    // Attribute
    private List<String> authors = new ArrayList<>();

    // Constructor
    public Book(int id, String title, String category, float cost) {
        super(id, title, category, cost);
    }

    // Method to add an author
    public void addAuthor(String authorName) {
        if (authors.contains(authorName)) {
            System.out.println("Pham Duy Dong - 5608 - Author is already in the list");
        } else {
            authors.add(authorName);
            System.out.println("Pham Duy Dong - 5608 - Added author successfully");
        }
    }

    // Method to remove an author
    public void removeAuthor(String authorName) {
        if (!authors.contains(authorName)) {
            System.out.println("Pham Duy Dong - 5608 - Author is absent in the list");
            return;
        }

        authors.remove(authorName);
        System.out.println("Pham Duy Dong - 5608 - Removed author successfully");
    }

    // Getter and Setter
    public List<String> getAuthors() { return authors; }

    public void setAuthors(List<String> authors) { this.authors = authors; }
}
```

Hình 5: Book Class extends Media

```
package hust.soict.dsai.aims.media;

public class DigitalVideoDisc extends Media {
    // Các thuộc tính bổ sung cho DigitalVideoDisc
    private String director;
    private int length;

    private static int nbDigitalVideoDiscs = 0;

    // Constructor 1: Tạo DVD chỉ với title
    public DigitalVideoDisc(String title) {
        super(++nbDigitalVideoDiscs, title); // Tăng số lượng DVD và gán ID tự động
    }

    // Constructor 2: Tạo DVD với category, title, cost
    public DigitalVideoDisc(String title, String category, float cost) {
        super(++nbDigitalVideoDiscs, title, category, cost); // Tăng số lượng DVD và gán ID tự động
    }


    // Constructor 3: Tạo DVD với director, category, title, cost
    public DigitalVideoDisc(String title, String category, String director, float cost) {
        super(++nbDigitalVideoDiscs, title, category, cost); // Tăng số lượng DVD và gán ID tự động
        this.director = director;
    }

    // Constructor 4: Tạo DVD với tất cả thuộc tính
    public DigitalVideoDisc(String title, String category, String director, int length, float cost) {
        super(++nbDigitalVideoDiscs, title, category, cost); // Tăng số lượng DVD và gán ID tự động
        this.director = director;
        this.length = length;
    }

    // Getter và Setter cho director
    public String getDirector() {
        return director;
    }

    public void setDirector(String director) {
        this.director = director;
    }
}
```

Hình 6: DigitalVideoDisc Class extends Media 1



```
// Getter và Setter cho length
public int getLength() {
    return length;
}

public void setLength(int length) {
    this.length = length;
}                                     //Pham Duy Dong - 5608

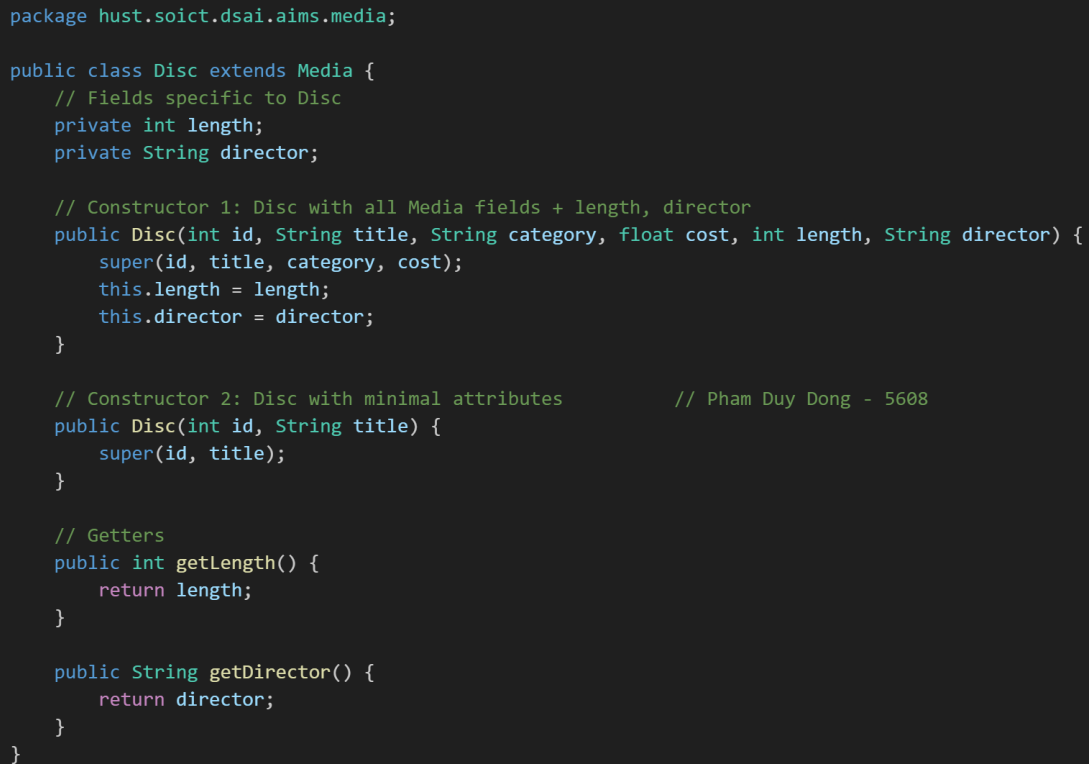
public boolean isMatch(String title) {
    return getTitle().equalsIgnoreCase(title); // Sử dụng getTitle() từ lớp Media
}

public String toString() {
    return super.toString() + " - Director: " + director + " - Length: " + length + " mins";
}
}
```

Hình 7: DigitalVideoDisc Class extends Media 2

3. Creating the CompactDisc class

3.1. Create the Disc class extending the Media class



```
package hust.soict.dsai.aims.media;

public class Disc extends Media {
    // Fields specific to Disc
    private int length;
    private String director;

    // Constructor 1: Disc with all Media fields + length, director
    public Disc(int id, String title, String category, float cost, int length, String director) {
        super(id, title, category, cost);
        this.length = length;
        this.director = director;
    }

    // Constructor 2: Disc with minimal attributes // Phạm Duy Đông - 5608
    public Disc(int id, String title) {
        super(id, title);
    }

    // Getters
    public int getLength() {
        return length;
    }

    public String getDirector() {
        return director;
    }
}
```

Hình 8: Disc Class

```

package hust.soict.dsai.aims.media;

public class DigitalVideoDisc extends Disc {

    private static int nbDigitalVideoDiscs = 0;

    // Constructor 1: Tạo DVD chỉ với title
    public DigitalVideoDisc(String title) {
        super(++nbDigitalVideoDiscs, title, null, 0, 0, null); // Gọi constructor của Disc với giá trị mặc định
    }

    // Constructor 2: Tạo DVD với category, title, cost
    public DigitalVideoDisc(String title, String category, float cost) {
        super(++nbDigitalVideoDiscs, title, category, cost, 0, null); // Gọi constructor của Disc với giá trị mặc định
    }

    // Constructor 3: Tạo DVD với director, category, title, cost
    public DigitalVideoDisc(String title, String category, String director, float cost) {
        super(++nbDigitalVideoDiscs, title, category, cost, 0, director); // Gọi constructor của Disc với length mặc định
    }

    // Constructor 4: Tạo DVD với tất cả thuộc tính
    public DigitalVideoDisc(String title, String category, String director, int length, float cost) {
        super(++nbDigitalVideoDiscs, title, category, cost, length, director); // Gọi đầy đủ constructor của Disc
    }

    public boolean isMatch(String title) {
        return getTitle().equalsIgnoreCase(title); // Sử dụng getTitle() từ lớp cha Disc/Media
    }

    public String toString() {
        return "DigitalVideoDisc - " + getTitle() + " - " + getCategory() + " - Director: " + getDirector()
            + " - Length: " + getLength() + " mins - " + getCost() + " $";
    }
}

```

Hình 9: DigitalVideoDisc Class extends Disc

```

package hust.soict.dsai.aims.media;

import java.util.ArrayList;
import java.util.List;

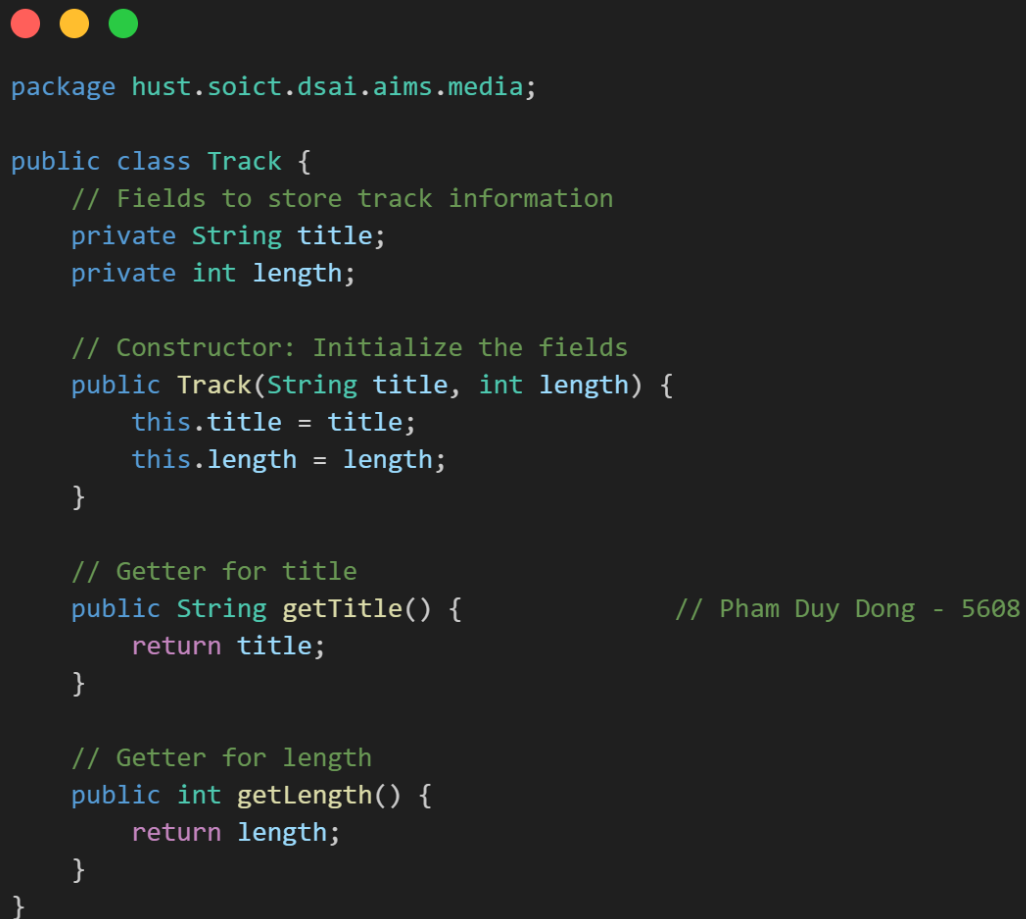
public class CompactDisc extends Disc {

}

```

Hình 10: CompactDisc Class extends Disc

3.2. Create the Track class



```
package hust.soict.dsai.aims.media;

public class Track {
    // Fields to store track information
    private String title;
    private int length;

    // Constructor: Initialize the fields
    public Track(String title, int length) {
        this.title = title;
        this.length = length;
    }

    // Getter for title
    public String getTitle() {
        return title;
    }

    // Getter for length
    public int getLength() {
        return length;
    }
}
```

The image shows a code editor window with a dark background and light-colored text. The code is written in Java and defines a `Track` class. The class has two private fields: `String title` and `int length`. It includes a constructor that takes `String title` and `int length` as parameters and initializes the fields. There are also two public getter methods: `getTitle()` and `getLength()`. The code is formatted with comments and indentation. The editor window has three colored circles (red, yellow, green) in the top left corner, indicating it is a standard OS window.

Hình 11: Track Class

3.3. Open the CompactDisc class

```
package hust.soict.dsai.aims.media;

import java.util.ArrayList;

public class CompactDisc extends Disc {
    private String artist;
    private ArrayList<Track> tracks = new ArrayList<>();

    // Constructor(s)
    public CompactDisc(int id, String title, String category, String artist, float cost, int length, String director) {
        super(id, title, category, cost, length, director);
        this.artist = artist; // Pham Duy Dong - 5608
    }

    // Getter for artist
    public String getArtist() {
        return artist;
    }

    // Method to add a track
    public void addTrack(Track track) {
        if (tracks.contains(track)) {
            System.out.println("Pham Duy Dong - 5608 - Track \"" + track.getTitle() + "\" is already in the CD.");
        } else {
            tracks.add(track);
            System.out.println("Pham Duy Dong - 5608 - Track \"" + track.getTitle() + "\" has been added to the CD.");
        }
    }

    // Method to remove a track
    public void removeTrack(Track track) {
        if (tracks.contains(track)) {
            tracks.remove(track);
            System.out.println("Pham Duy Dong - 5608 - Track \"" + track.getTitle() + "\" has been removed from the CD.");
        } else {
            System.out.println("Pham Duy Dong - 5608 - Track \"" + track.getTitle() + "\" is not in the CD.");
        }
    }
}
```

Hình 12: CompactDisc Class using Track

```
// Method to calculate total length of the CD
public int getLength() {
    int totalLength = 0;
    for (Track track : tracks) {
        totalLength += track.getLength();
    }
    return totalLength;
}
```

Hình 13: Method getLength of CompactDisc

4. Create the Playable interface



```
package hust.soict.dsai.aims.media;  
  
public class Playable {  
    public void play() {};  
}
```

//Pham Duy Dong - 5608

Hình 14: Playable interface



```
package hust.soict.dsai.aims.media;  
  
import java.util.ArrayList;  
  
public class CompactDisc extends Disc implements Playable {  
    private String artist;  
    private ArrayList<Track> tracks = new ArrayList<>();  
}
```

Hình 15: Implement the Playable with CompactDisc

```
package hust.soict.dsai.aims.media;

public class DigitalVideoDisc extends Disc implements Playable {

    private static int nbDigitalVideoDiscs = 0;           //Pham Duy Dong - 5608

    // Constructor 1: Tạo DVD chỉ với title
    public DigitalVideoDisc(String title) {
        super(++nbDigitalVideoDiscs, title, null, 0, 0, null); // Gọi constructor của Disc với giá trị mặc định
    }
}
```

Hình 16: Implement the Playable with DigitalVideoDisc

```
package hust.soict.dsai.aims.media;

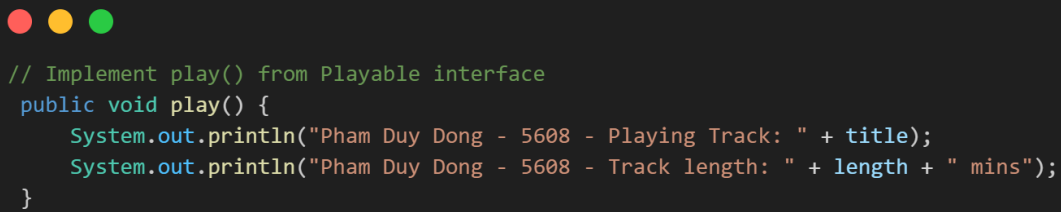
public class Track implements Playable {
    // Fields to store track information
    private String title;           //Pham Duy Dong - 5608
    private int length;

    // Constructor: Initialize the fields
    public Track(String title, int length) {
        this.title = title;
        this.length = length;
    }
}
```

Hình 17: Implement the Playable with Track

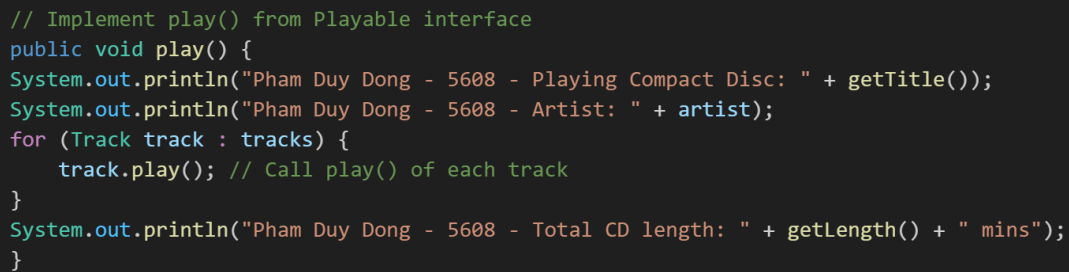
```
// Implement play() from Playable interface
public void play() {
    System.out.println("Pham Duy Dong - 5608 - Playing DVD: " + getTitle());
    System.out.println("Pham Duy Dong - 5608 - DVD length: " + getLength() + " mins");
}
```

Hình 18: Implement play() for DigitalVideoDisc



```
// Implement play() from Playable interface
public void play() {
    System.out.println("Pham Duy Dong - 5608 - Playing Track: " + title);
    System.out.println("Pham Duy Dong - 5608 - Track length: " + length + " mins");
}
```

Hình 19: Implement play() for Track



```
// Implement play() from Playable interface
public void play() {
    System.out.println("Pham Duy Dong - 5608 - Playing Compact Disc: " + getTitle());
    System.out.println("Pham Duy Dong - 5608 - Artist: " + artist);
    for (Track track : tracks) {
        track.play(); // Call play() of each track
    }
    System.out.println("Pham Duy Dong - 5608 - Total CD length: " + getLength() + " mins");
}
```

Hình 20: Implement play() for CompactDisc

5. Update the Cart class to work with Media

```
package hust.soict.dsai.aims.cart;
import hust.soict.dsai.aims.media.Media;
import java.util.ArrayList;

public class Cart {
    public static final int MAX_NUMBERS_ORDERED = 20; // Still keeping this limit as a safeguard
    private ArrayList<Media> itemsOrdered = new ArrayList<>(); // Use ArrayList to store Media objects

    // Method to add Media to the cart
    public void addMedia(Media media) {
        if (itemsOrdered.size() >= MAX_NUMBERS_ORDERED) {
            System.out.println("Pham Duy Dong - 5608 - The cart is full, cannot add more items.");
        } else {
            itemsOrdered.add(media);
            System.out.println("Pham Duy Dong - 5608 - The media has been added to the cart.");
        }
    }

    // Method to remove Media from the cart
    public void removeMedia(Media media) {
        if (itemsOrdered.contains(media)) {
            itemsOrdered.remove(media);
            System.out.println("Pham Duy Dong - 5608 - The media has been removed from the cart.");
        } else {
            System.out.println("Pham Duy Dong - 5608 - The media was not found in the cart.");
        }
    }

    // Method to calculate the total cost of the cart
    public float totalCost() {
        float total = 0.0f;
        for (Media media : itemsOrdered) {
            total += media.getCost(); // Each Media has a getCost() method
        }
        return total;
    }
}
```

Hình 21: Update the Cart class to work with Media 1

```
// Method to print Cart
public void print() {
    System.out.println("*****CART*****");
    System.out.println("Pham Duy Dong - 5608 - Ordered Items:");

    for (int i = 0; i < itemsOrdered.size(); i++) {
        System.out.println((i + 1) + ". " + itemsOrdered.get(i).toString());
    }

    System.out.println("Pham Duy Dong - 5608 - Total cost: " + totalCost() + " $");
    System.out.println("*****");
}

// Search by ID
public Media searchById(int id) {
    for (Media media : itemsOrdered) {
        if (media.getId() == id) { // Assuming getId() exists in Media
            return media;
        }
    }
    return null;
}

// Search by Title
public Media searchByTitle(String title) {
    for (Media media : itemsOrdered) {
        if (media.isMatch(title)) { // Assuming isMatch() exists in Media
            return media;
        }
    }
    return null;
}
}
```

Hình 22: Update the Cart class to work with Media 2

6. Update the Store class to work with Media

```
package hust.soict.dsai.aims.store;

import java.util.ArrayList;
import hust.soict.dsai.aims.media.Media;

public class Store {
    private ArrayList<Media> itemsInStore; // Dynamic list for Media items
    private static int nextId = 1; // Static variable to track the next unique ID

    // Constructor
    public Store() {
        itemsInStore = new ArrayList<>();
    }

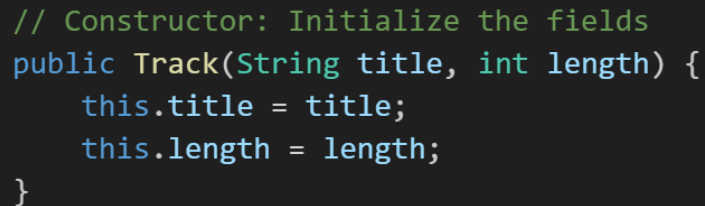
    // Method to add a Media item to the store
    public void addMedia(Media media) {
        if (itemsInStore.contains(media)) {
            System.out.println("Pham Duy Dong - 5608 - Media \"" + media.getTitle() + "\" is already in the store.");
        } else {
            itemsInStore.add(media);
            System.out.println("Pham Duy Dong - 5608 - Media \"" + media.getTitle() + "\" has been added to the store.");
        }
    }

    // Method to remove a Media item from the store
    public void removeMedia(Media media) {
        if (itemsInStore.contains(media)) {
            itemsInStore.remove(media);
            System.out.println("Pham Duy Dong - 5608 - Media \"" + media.getTitle() + "\" has been removed from the store.");
        } else {
            System.out.println("Pham Duy Dong - 5608 - Media \"" + media.getTitle() + "\" was not found in the store.");
        }
    }

    // Method to display all Media items in the store
    public void printStore() {
        System.out.println("*****STORE*****");
        if (itemsInStore.isEmpty()) {
            System.out.println("Pham Duy Dong - 5608 - The store is currently empty.");
        } else {
            System.out.println("Pham Duy Dong - 5608 - Items in the store:");
            for (int i = 0; i < itemsInStore.size(); i++) {
                System.out.println((i + 1) + ". " + itemsInStore.get(i).toString());
            }
        }
        System.out.println("*****");
    }
}
```


Hình 23: Update the Store class to work with Media

7. Constructors of whole classes and parent classes



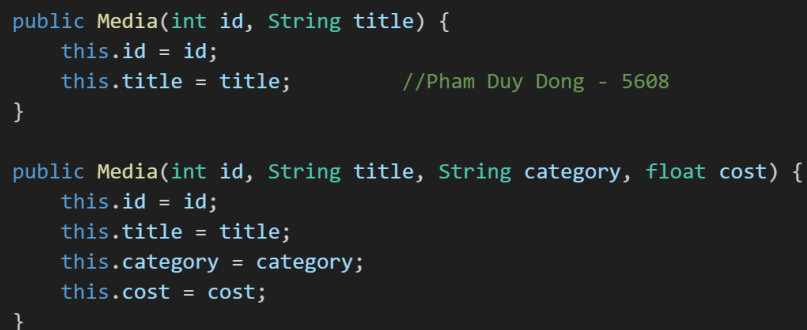
```
// Constructor: Initialize the fields
public Track(String title, int length) {
    this.title = title;
    this.length = length;
}
```

Hình 24: Constructor of Track



```
// Constructor(s)
public CompactDisc(int id, String title, String category, String artist, float cost, int length, String director) {
    super(id, title, category, cost, length, director);
    this.artist = artist;           //Pham Duy Dong - 5608
}
```

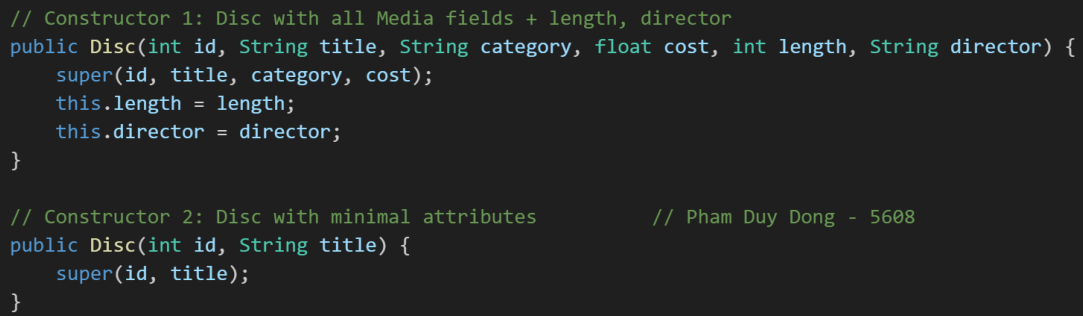
Hình 25: Constructor of CompactDisc



```
public Media(int id, String title) {
    this.id = id;
    this.title = title;           //Pham Duy Dong - 5608
}

public Media(int id, String title, String category, float cost) {
    this.id = id;
    this.title = title;
    this.category = category;
    this.cost = cost;
}
```

Hình 26: Constructor of Media



```
// Constructor 1: Disc with all Media fields + length, director
public Disc(int id, String title, String category, float cost, int length, String director) {
    super(id, title, category, cost);
    this.length = length;
    this.director = director;
}

// Constructor 2: Disc with minimal attributes // Pham Duy Dong - 5608
public Disc(int id, String title) {
    super(id, title);
}
```

Hình 27: Constructor of Disc

8. Unique item in a list

```
public boolean equals(Object obj) {           // Pham Duy Dong - 5608
    if (this == obj) return true; // Check reference equality
    if (obj == null || getClass() != obj.getClass()) return false; // Check null and class type

    Media media = (Media) obj; // Cast object to Media
    return title != null && title.equalsIgnoreCase(media.getTitle()); // Compare titles
}
```

Hình 28: Override equals in Media class

```
public boolean equals(Object obj) {           // Pham Duy Dong - 5608
    if (this == obj) return true; // Check reference equality
    if (obj == null || getClass() != obj.getClass()) return false; // Check null and class type

    Track track = (Track) obj; // Cast object to Track
    return length == track.getLength() && title != null && title.equalsIgnoreCase(track.getTitle()); // Compare title and length
}
```

Hình 29: Override equals in Track class

9. Polymorphism with toString() method

```
public String toString() {
    return "Media{" +
        "id=" + id +
        ", title = '" + title + '\'' +
        ", category = '" + category + '\'' +
        ", cost = '" + cost + '\'' ;
}
```

Hình 30: Override toString in Media Class

```
package hust.soict.dsai.test.polymorphism;

import hust.soict.dsai.aims.media.*;
import java.util.ArrayList;
import java.util.List;

public class PolymorphismTest {
    public static void main(String[] args) {
        // Tạo danh sách chứa các đối tượng Media
        List<Media> medialist = new ArrayList<>();

        // Tạo các đối tượng Media khác nhau (Book, CompactDisc, Disc)
        Book book = new Book(1, "The Alchemist", "Fiction", 9.99f);
        book.addAuthor("Paulo Coelho"); // Thêm tác giả vào Book
        book.addAuthor("John Doe");

        CompactDisc cd = new CompactDisc(2, "Best of 2023", "Music", "Various Artists", 15.99f, 80, "Producer A");
        Track track1 = new Track("Track 1", 3);
        Track track2 = new Track("Track 2", 5);
        cd.addTrack(track1); // Thêm các track vào CD
        cd.addTrack(track2);

        Disc dvd = new Disc(3, "Inception", "Sci-Fi", 12.99f, 148, "Christopher Nolan");

        // Thêm các đối tượng vào danh sách Media //Phạm Duy Dong - 5608
        medialist.add(book);
        medialist.add(cd);
        medialist.add(dvd);

        // Duyệt qua danh sách và in ra thông tin của từng đối tượng
        for (Media media : medialist) {
            System.out.println(media.toString());

            // Kiểm tra nếu đối tượng là CompactDisc, gọi thêm phương thức play()
            if (media instanceof CompactDisc) {
                ((CompactDisc) media).play();
            }
        }
    }
}
```

Hình 31: Sample code for Polymorphism

```

● PS C:\IT3103.744528.2024.1.20225608.PhamDuyDong> c::; cd 'c:\IT3103.744528.20
'-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Pham Duy Dong\AppData
hat.java\jdt_ws\IT3103.744528.2024.1.20225608.PhamDuyDong_90189cec\bin' 'hust
Pham Duy Dong - 5608 - Added author successfully
Pham Duy Dong - 5608 - Added author successfully
Pham Duy Dong - 5608 - Track "Track 1" has been added to the CD.
Pham Duy Dong - 5608 - Track "Track 2" has been added to the CD.
Media{id=1, title = 'The Alchemist', category = 'Fiction', cost = '9.99'}
Media{id=2, title = 'Best of 2023', category = 'Music', cost = '15.99'}
Pham Duy Dong - 5608 - Playing Compact Disc: Best of 2023
Pham Duy Dong - 5608 - Artist: Various Artists
Pham Duy Dong - 5608 - Playing Track: Track 1
Pham Duy Dong - 5608 - Track length: 3 mins
Pham Duy Dong - 5608 - Playing Track: Track 2
Pham Duy Dong - 5608 - Track length: 5 mins
Pham Duy Dong - 5608 - Total CD length: 8 mins
Media{id=3, title = 'Inception', category = 'Sci-Fi', cost = '12.99'}

```

Hình 32: Result of Polymorphism

10. Sort media in the cart

```

package hust.soict.dsai.aims.media;

import java.util.Comparator;

public class MediaComparatorByTitleCost implements Comparator<Media> {
    public int compare(Media m1, Media m2) {
        int titleComparison = m1.getTitle().compareToIgnoreCase(m2.getTitle());
        if (titleComparison != 0) {
            return titleComparison;    // Pham Duy Dong - 5608
        }
        return Float.compare(m2.getCost(), m1.getCost());
    }
}

```

Hình 33: Media Comparator by title-cost

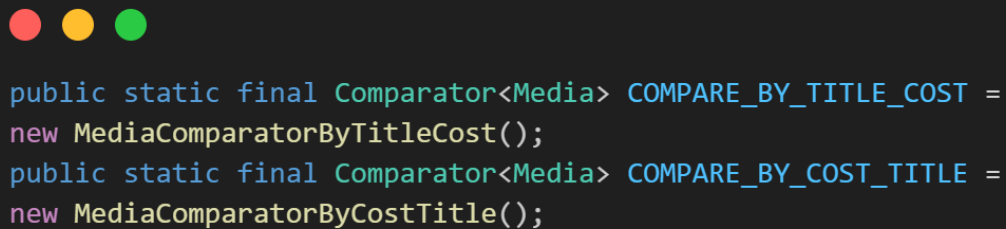


```
package hust.soict.dsai.aims.media;

import java.util.Comparator;

public class MediaComparatorByCostTitle implements Comparator<Media> {
    public int compare(Media m1, Media m2) {
        int costComparison = Float.compare(m2.getCost(), m1.getCost());
        if (costComparison != 0) {
            return costComparison; //Pham Duy Dong - 5608
        }
        return m1.getTitle().compareToIgnoreCase(m2.getTitle());
    }
}
```

Hình 34: Media Comparator by cost-title



```
public static final Comparator<Media> COMPARE_BY_TITLE_COST =
    new MediaComparatorByTitleCost();
public static final Comparator<Media> COMPARE_BY_COST_TITLE =
    new MediaComparatorByCostTitle();
```

Hình 35: Add two Comparators to Media

```
package hust.soict.dsai.test.polymorphism;

import hust.soict.dsai.aims.media.*;

import java.util.ArrayList;
import java.util.Collections;
import java.util.List;

public class PolymorphismTest {
    public static void main(String[] args) {
        // Tạo danh sách Media
        List<Media> mediaList = new ArrayList<>();

        // Tạo các đối tượng Media
        mediaList.add(new Book(1, "The Alchemist", "Fiction", 9.99f));
        mediaList.add(new Book(2, "The Alchemist", "Fiction", 15.99f));
        mediaList.add(new Book(3, "Harry Potter", "Fantasy", 19.99f));
        mediaList.add(new Disc(4, "Inception", "Sci-Fi", 12.99f, 148, "Christopher Nolan"));
        mediaList.add(new CompactDisc(5, "Best of 2023", "Music", "Various Artists", 9.99f, 80, "Producer A"));

        // In danh sách ban đầu
        System.out.println("Pham Duy Dong - 5608 - Before sorting:");
        for (Media media : mediaList) {
            System.out.println(media);
        }

        // Sắp xếp theo Title -> Cost
        Collections.sort(mediaList, Media.COMPARE_BY_TITLE_COST);
        System.out.println("\nPham Duy Dong - 5608 - After sorting by Title -> Cost:");
        for (Media media : mediaList) {
            System.out.println(media);
        }

        // Sắp xếp theo Cost -> Title
        Collections.sort(mediaList, Media.COMPARE_BY_COST_TITLE);
        System.out.println("\nPham Duy Dong - 5608 - After sorting by Cost -> Title:");
        for (Media media : mediaList) {
            System.out.println(media);
        }
    }
}
```

Hình 36: Sample code for Sorting media in cart

```

Pham Duy Dong - 5608 - Before sorting:
Media{id=1, title = 'The Alchemist', category = 'Fiction', cost = '9.99'}
Media{id=2, title = 'The Alchemist', category = 'Fiction', cost = '15.99'}
Media{id=3, title = 'Harry Potter', category = 'Fantasy', cost = '19.99'}
Media{id=4, title = 'Inception', category = 'Sci-Fi', cost = '12.99'}
Media{id=5, title = 'Best of 2023', category = 'Music', cost = '9.99'}

Pham Duy Dong - 5608 - After sorting by Title -> Cost:
Media{id=5, title = 'Best of 2023', category = 'Music', cost = '9.99'}
Media{id=3, title = 'Harry Potter', category = 'Fantasy', cost = '19.99'}
Media{id=4, title = 'Inception', category = 'Sci-Fi', cost = '12.99'}
Media{id=2, title = 'The Alchemist', category = 'Fiction', cost = '15.99'}
Media{id=1, title = 'The Alchemist', category = 'Fiction', cost = '9.99'}

Pham Duy Dong - 5608 - After sorting by Cost -> Title:
Media{id=3, title = 'Harry Potter', category = 'Fantasy', cost = '19.99'}
Media{id=2, title = 'The Alchemist', category = 'Fiction', cost = '15.99'}
Media{id=4, title = 'Inception', category = 'Sci-Fi', cost = '12.99'}
Media{id=5, title = 'Best of 2023', category = 'Music', cost = '9.99'}
Media{id=1, title = 'The Alchemist', category = 'Fiction', cost = '9.99'}

```

Hình 37: Result of sorting

11. Create a complete console application in the Aims class

```

-----
1. View store
2. Update store
3. See current cart
0. Exit
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3:

```

Hình 38: Main menu

11.1. View store

```
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3: 1

Pham Duy Dong - 5608 - STORE INVENTORY:
*****STORE*****
Pham Duy Dong - 5608 - Items in the store:
1. DigitalVideoDisc - The Lion King - Animation - Director: Roger Allers - Length: 87 mins - 19.95 $
2. DigitalVideoDisc - Star Wars - Science Fiction - Director: George Lucas - Length: 124 mins - 24.95 $
3. DigitalVideoDisc - Aladdin - Animation - Director: John Musker - Length: 90 mins - 18.99 $
4. Media{id=4, title = 'Harry Potter', category = 'Fantasy', cost = '29.99'}
5. Media{id=5, title = 'Best Hits 2023', category = 'Music', cost = '15.99'}
*****
Pham Duy Dong - 5608 - Options:
-----
1. See a media's details
2. Add a media to cart
3. Play a media
4. See current cart
0. Back
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3-4: █
```

Hình 39: View store menu

11.1.1. See a media's details

```
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3-4: 1
Pham Duy Dong - 5608 - Enter the title of the media: Aladdin

Media Details:
DigitalVideoDisc - Aladdin - Animation - Director: John Musker - Length: 90 mins - 18.99 $
Pham Duy Dong - 5608 - Options:
-----
1. Add to cart
2. Play
0. Back
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2: 1
Pham Duy Dong - 5608 - The media has been added to the cart.
```

Hình 40: See a media's details

11.1.2. Add a media to cart

```
Pham Duy Dong - 5608 - Options:
-----
1. See a media's details
2. Add a media to cart
3. Play a media
4. See current cart
0. Back
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3-4: 2
Pham Duy Dong - 5608 - Enter the title of the media to add to cart: Star Wars
Pham Duy Dong - 5608 - The media has been added to the cart.
Added Star Wars to cart.
```

Hình 41: Add a media to cart

11.1.3. Play a media

```
Pham Duy Dong - 5608 - Options:
-----
1. See a media's details
2. Add a media to cart
3. Play a media
4. See current cart
0. Back
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3-4: 3
Pham Duy Dong - 5608 - Enter the title of the media to play: The Lion King
Pham Duy Dong - 5608 - Playing DVD: The Lion King
Pham Duy Dong - 5608 - DVD length: 87 mins
```

Hình 42: Play a media

11.1.4. See current cart

```
Pham Duy Dong - 5608 - Options:
-----
1. See a media's details
2. Add a media to cart
3. Play a media
4. See current cart
0. Back
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3-4: 4

Pham Duy Dong - 5608 - CURRENT CART:
*****CART*****
Pham Duy Dong - 5608 - Ordered Items:
1. DigitalVideoDisc - Aladdin - Animation - Director: John Musker - Length: 90 mins - 18.99 $
2. DigitalVideoDisc - Star Wars - Science Fiction - Director: George Lucas - Length: 124 mins - 24.95 $
Pham Duy Dong - 5608 - Total cost: 43.940002 $
*****
```

Hình 43: See current cart

11.2. Update store

```
Pham Duy Dong - 5608 - AIMS:
-----
1. View store
2. Update store
3. See current cart
0. Exit
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3: 2
Pham Duy Dong - 5608 - Update store:
1. Add a media
2. Remove a media
Choose an option: █
```

Hình 44: Update store menu

11.2.1. Add a media

```
Pham Duy Dong - 5608 - Update store:
1. Add a media
2. Remove a media
Choose an option: 1
Pham Duy Dong - 5608 - Enter the title of the new media: Nhu mot vi tinh tu
Enter category: Music
Enter cost: 32
Pham Duy Dong - 5608 - Media "Nhu mot vi tinh tu" has been added to the store.
Pham Duy Dong - 5608 - Media added to store.
```

Hình 45: Add a media

11.2.2. Remove a media

```
Pham Duy Dong - 5608 - Update store:
1. Add a media
2. Remove a media
Choose an option: 2
Pham Duy Dong - 5608 - Enter the title of the media to remove: Nhu mot vi tinh tu
Pham Duy Dong - 5608 - Media "Nhu mot vi tinh tu" has been removed from the store.
Media removed from store.
```

Hình 46: Remove a media

11.3. See current cart

```
Pham Duy Dong - 5608 - AIMS:
-----
1. View store
2. Update store
3. See current cart
0. Exit
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3: 3

Pham Duy Dong - 5608 - CURRENT CART:
*****CART*****
Pham Duy Dong - 5608 - Ordered Items:
1. DigitalVideoDisc - Aladdin - Animation - Director: John Musker - Length: 90 mins - 18.99 $
2. DigitalVideoDisc - Star Wars - Science Fiction - Director: George Lucas - Length: 124 mins - 24.95 $
Pham Duy Dong - 5608 - Total cost: 43.940002 $
*****
Pham Duy Dong - 5608 - Options:
-----
1. Filter medias in cart
2. Sort medias in cart
3. Remove media from cart
4. Play a media
5. Place order
0. Back
-----
```

Hình 47: See current cart

11.3.1. Filter medias in cart

```
Pham Duy Dong - 5608 - Options:
-----
1. Filter medias in cart
2. Sort medias in cart
3. Remove media from cart
4. Play a media
5. Place order
0. Back
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3-4-5: 1
Choose filtering option:
1. Filter by ID
2. Filter by title
Your choice: 1
Enter media ID to filter: 2
DigitalVideoDisc - Star Wars - Science Fiction - Director: George Lucas - Length: 124 mins - 24.95 $
```

Hình 48: Filter by ID

```
Pham Duy Dong - 5608 - Options:
-----
1. Filter medias in cart
2. Sort medias in cart
3. Remove media from cart
4. Play a media
5. Place order
0. Back
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3-4-5: 1
Choose filtering option:
1. Filter by ID
2. Filter by title
Your choice: 2
Enter media title to filter: Aladdin
DigitalVideoDisc - Aladdin - Animation - Director: John Musker - Length: 90 mins - 18.99 $
```

Hình 49: Filter by title

11.3.2. Sort medias in cart

```

Pham Duy Dong - 5608 - Options:
-----
1. Filter medias in cart
2. Sort medias in cart
3. Remove media from cart
4. Play a media
5. Place order
0. Back
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3-4-5: 2
Choose sorting option:
1. Sort by title
2. Sort by cost
Your choice: 1
The cart has been sorted by title.
*****CART*****
Pham Duy Dong - 5608 - Ordered Items:
1. DigitalVideoDisc - Aladdin - Animation - Director: John Musker - Length: 90 mins - 18.99 $
2. DigitalVideoDisc - Star Wars - Science Fiction - Director: George Lucas - Length: 124 mins - 24.95 $
Pham Duy Dong - 5608 - Total cost: 43.940002 $
*****

```

Hình 50: Sort by title

```

Pham Duy Dong - 5608 - Options:
-----
1. Filter medias in cart
2. Sort medias in cart
3. Remove media from cart
4. Play a media
5. Place order
0. Back
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3-4-5: 2
Choose sorting option:
1. Sort by title
2. Sort by cost
Your choice: 2
The cart has been sorted by cost.
*****CART*****
Pham Duy Dong - 5608 - Ordered Items:
1. DigitalVideoDisc - Star Wars - Science Fiction - Director: George Lucas - Length: 124 mins - 24.95 $
2. DigitalVideoDisc - Aladdin - Animation - Director: John Musker - Length: 90 mins - 18.99 $
Pham Duy Dong - 5608 - Total cost: 43.940002 $
*****

```

Hình 51: Sort by cost

11.3.3. Remove media from cart

```
Pham Duy Dong - 5608 - Options:
-----
1. Filter medias in cart
2. Sort medias in cart
3. Remove media from cart
4. Play a media
5. Place order
0. Back
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3-4-5: 3
Pham Duy Dong - 5608 - Enter the title of the media to remove: Star Wars
Pham Duy Dong - 5608 - The media has been removed from the cart.
Removed Star Wars from cart.
```

Hình 52: Remove media from cart

```
Pham Duy Dong - 5608 - AIMS:
-----
1. View store
2. Update store
3. See current cart
0. Exit
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3: 3

Pham Duy Dong - 5608 - CURRENT CART:
*****CART*****
Pham Duy Dong - 5608 - Ordered Items:
1. DigitalVideoDisc - Aladdin - Animation - Director: John Musker - Length: 90 mins - 18.99 $
Pham Duy Dong - 5608 - Total cost: 18.99 $
*****
```

Hình 53: Result of remove media from cart

11.3.4. Play a media

```
Pham Duy Dong - 5608 - Options:
-----
1. Filter medias in cart
2. Sort medias in cart
3. Remove media from cart
4. Play a media
5. Place order
0. Back
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3-4-5: 4
Pham Duy Dong - 5608 - Enter the title of the media to play: Aladdin
Pham Duy Dong - 5608 - Playing DVD: Aladdin
Pham Duy Dong - 5608 - DVD length: 90 mins
```

Hình 54: Play a media

11.3.5. Place order

```
Pham Duy Dong - 5608 - Options:
-----
1. Filter medias in cart
2. Sort medias in cart
3. Remove media from cart
4. Play a media
5. Place order
0. Back
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3-4-5: 5
Pham Duy Dong - 5608 - Order placed successfully!
The cart has been emptied.
```

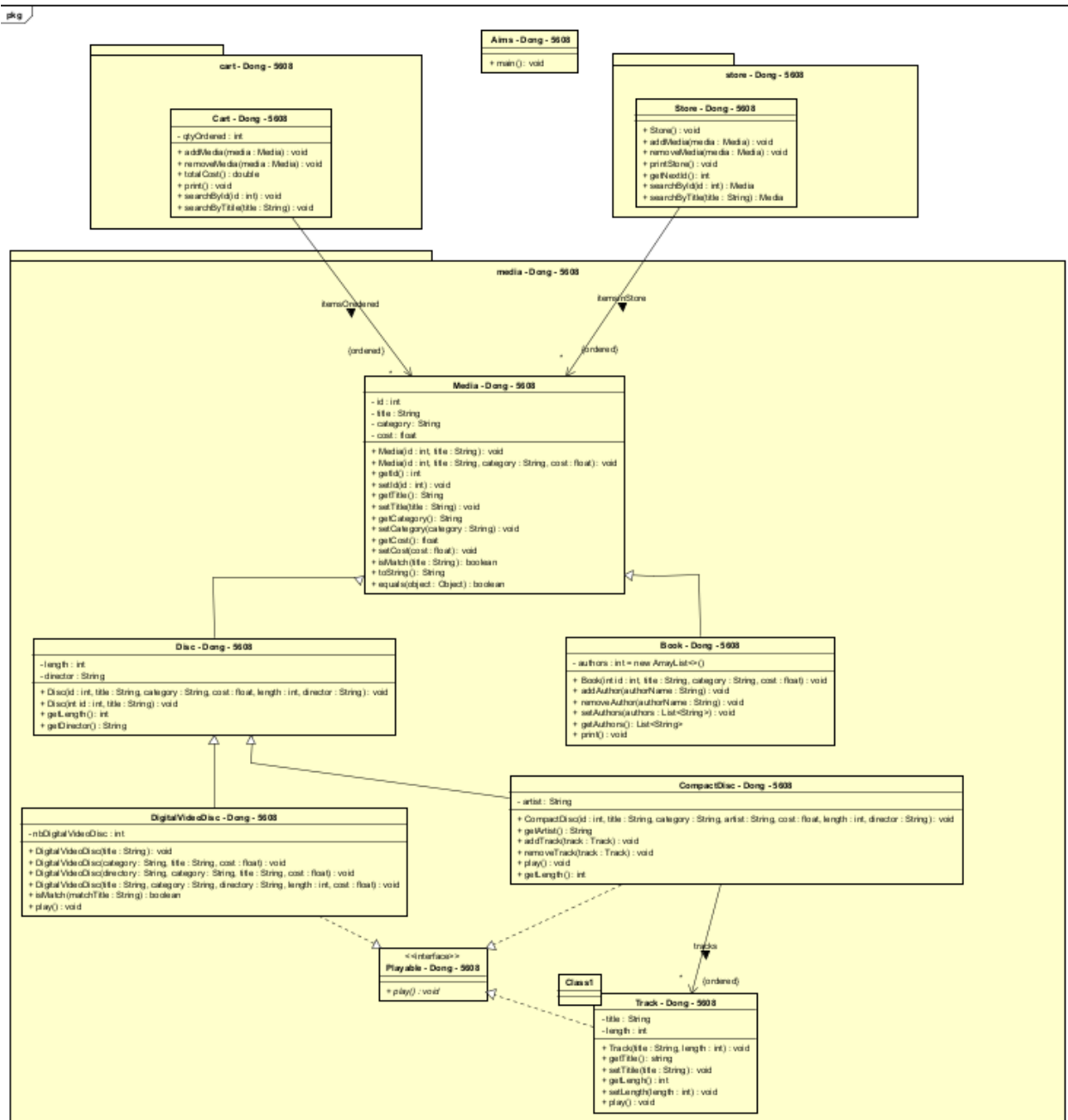
Hình 55: Place order

```
Pham Duy Dong - 5608 - AIMS:
-----
1. View store
2. Update store
3. See current cart
0. Exit
-----
Pham Duy Dong - 5608 - Please choose a number: 0-1-2-3: 3

Pham Duy Dong - 5608 - CURRENT CART:
*****CART*****
Pham Duy Dong - 5608 - Ordered Items:
Pham Duy Dong - 5608 - Total cost: 0.0 $
*****
```

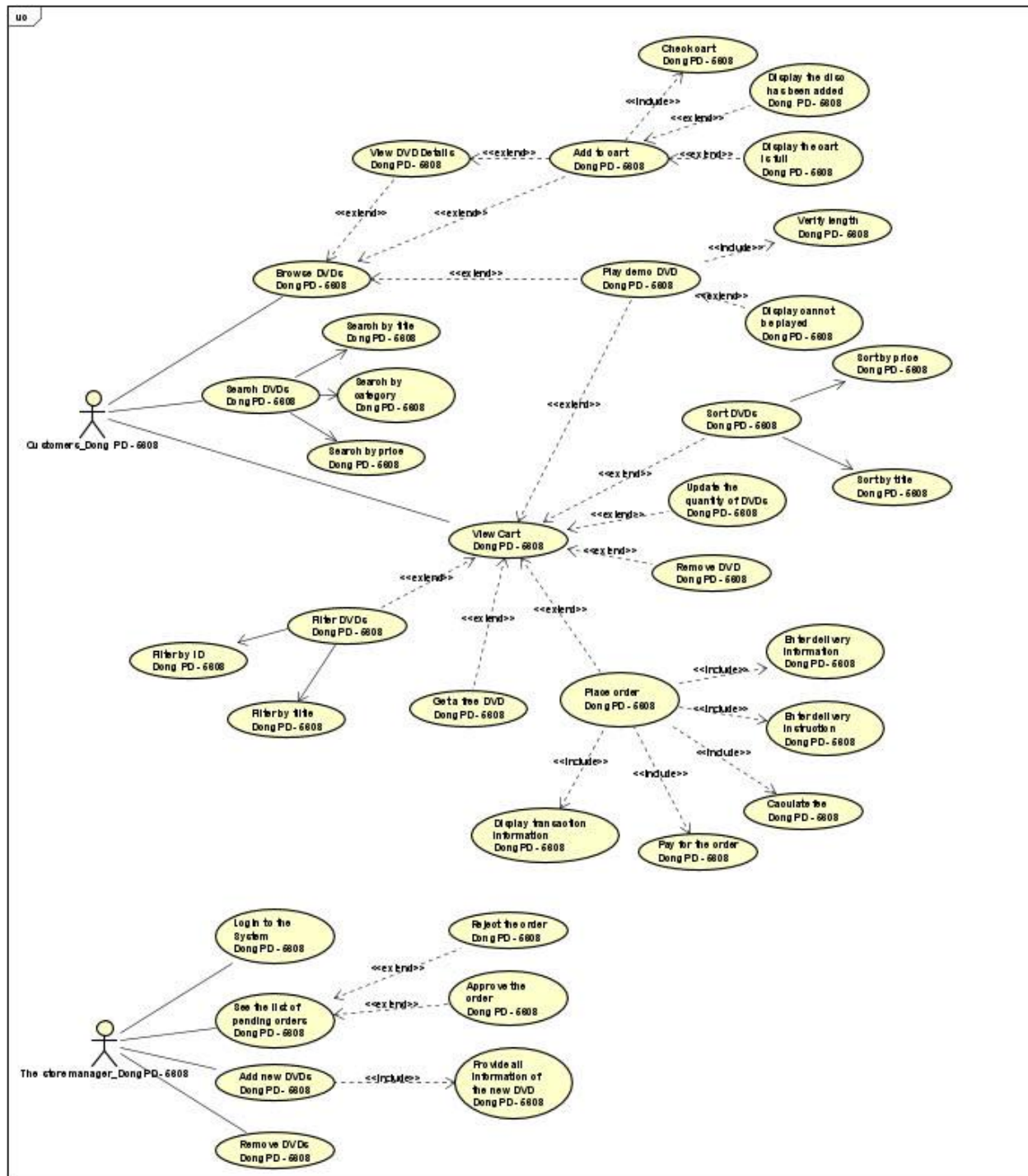
Hình 56: Result of Place order

12. Class Diagram



Hình 57: Class Diagram

13. UseCase Diagram



Hình 58: UseCase Diagram