SE Project-2 Report

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Team Members

1) Vineeth Bhat (2021101103)

2) Ishwar B Balappanawar (2021101023)

3) Swayam Agrawal (2021101068)

4) Mitansh Kayathwal (2021101026)

5) G.L.Vaishnavi (2023204009)

Feature 1 : Better User Management

Introduction

Our app has a user management system already in place, which you have already looked at in detail. The current flow of creating a user involves logging into an admin account and creating a new user manually. However, this is neither intuitive nor convenient, and thus demands an improvement.

Objective: We wish to enhance user experience and convenience by enabling self user registration directly from the login page.

Plan

We first addressed the issue with the broken Nav Bar, which previously displayed an option to Logout even before a user had logged in.

To improve user experience during registration, we decided to introduce a "Sign Up" tab in the Nav Bar. This addition aims to make the registration process more intuitive and accessible for users.

When users click on the Sign Up tab, they are directed to a user interface (UI) similar to the Login page for consistency. The registration page requires users to enter their username, email address, and password with the following specifications:

- Email uniqueness check: The system verifies that the entered email has not been registered before.
- Password confirmation: Users are prompted to enter their password twice for confirmation.
- Validation checks: The system enforces checks such as valid email format, a minimum password length of 8 characters, etc.

Both the Login and Sign Up processes feature robust error handling mechanisms that provide clear warnings to users about any incorrect inputs.

The Sign Up button remains disabled until all validation requirements are met. This measure not only ensures data integrity but also prevents any invalid requests from reaching the backend server.

Upon successful registration, users are automatically redirected to the Login page to access their newly created accounts.

Design Patterns

Chain of Responsibility

We leveraged the Chain of Responsibility pattern to refactor the `validateSecurePassword` function, which previously relied on multiple validation functions for different password criteria. Here are the steps we took to implement this pattern:

1. **Handler Interface:**
   - We created the `PasswordHandler` interface, serving as a base abstract class, or interface, for all handlers involved in the validation process.
2. **Concrete Handler Classes:**
   - Multiple concrete handler classes were implemented, each responsible for validating a specific aspect of the password (e.g., length, presence of digits, lowercase characters, uppercase characters, special characters).
   - Each handler class adheres to the `PasswordHandler` interface and throws an exception if the specific validation rule is not met.
   - Implemented concrete handler classes (`LengthHandler`, `DigitHandler`, `LowercaseHandler`, `UppercaseHandler`, `SpecialCharHandler`) that implement the `PasswordHandler` interface.
3. **Chain Construction:**
   - The handlers were chained together to form a validation pipeline, where each handler processes the password according to its validation rule.

This refactoring effort seamlessly integrated into our existing codebase, enhancing maintainability and extensibility.

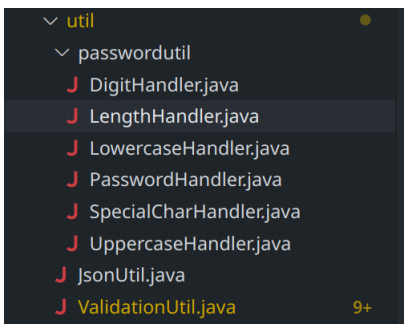
In summary, the Chain of Responsibility pattern facilitated a modular and organized approach to password validation, improving code readability and scalability in managing different validation rules.

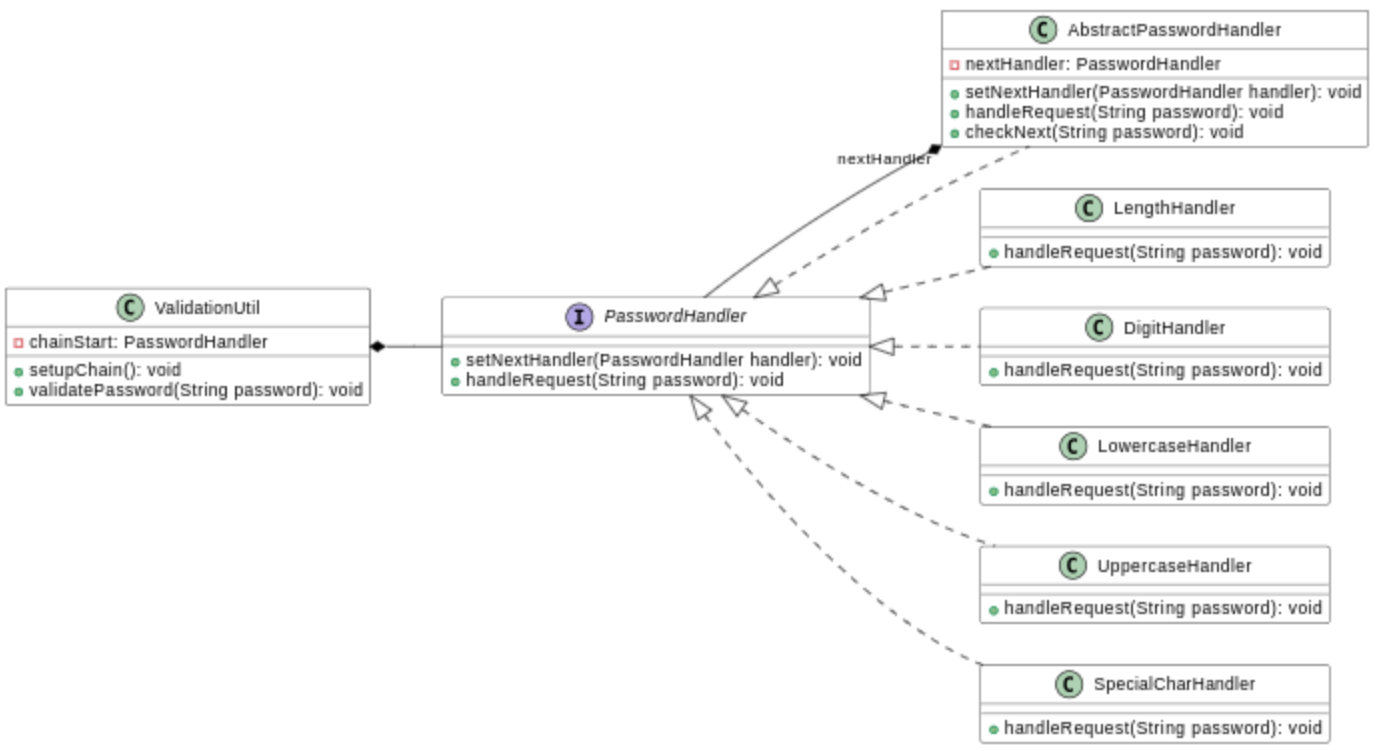
Overall, these changes encapsulate each password validation rule in separate handler classes, adhering to the principles of the Chain of Responsibility pattern. The validation pipeline ensures that each rule is checked sequentially, and validation stops at the first rule violation, throwing an appropriate exception.

```java
/**
 * Password Validate.
 *
 * @param s String to validate
 * @param name Name of the parameter
 * @throws JSONException
 */
public static void validateSecurePassword(String s, String name) throws JSONException {
    PasswordHandler lengthHandler = new LengthHandler();
    PasswordHandler digitHandler = new DigitHandler();
    PasswordHandler lowercaseHandler = new LowercaseHandler();
    PasswordHandler uppercaseHandler = new UppercaseHandler();
    PasswordHandler specialCharHandler = new SpecialCharHandler();

    lengthHandler.setNextHandler(digitHandler);
    digitHandler.setNextHandler(lowercaseHandler);
    lowercaseHandler.setNextHandler(uppercaseHandler);
    uppercaseHandler.setNextHandler(specialCharHandler);

    lengthHandler.handleRequest(s, name);
}
```





Implementation Detail

Front End

`signup/html`

`Signup.js`

These files were added to handle the front end part. Including the Sign Up page and functionalities to perform the necessary requests to the server for the registration of the signed up user.

Back End

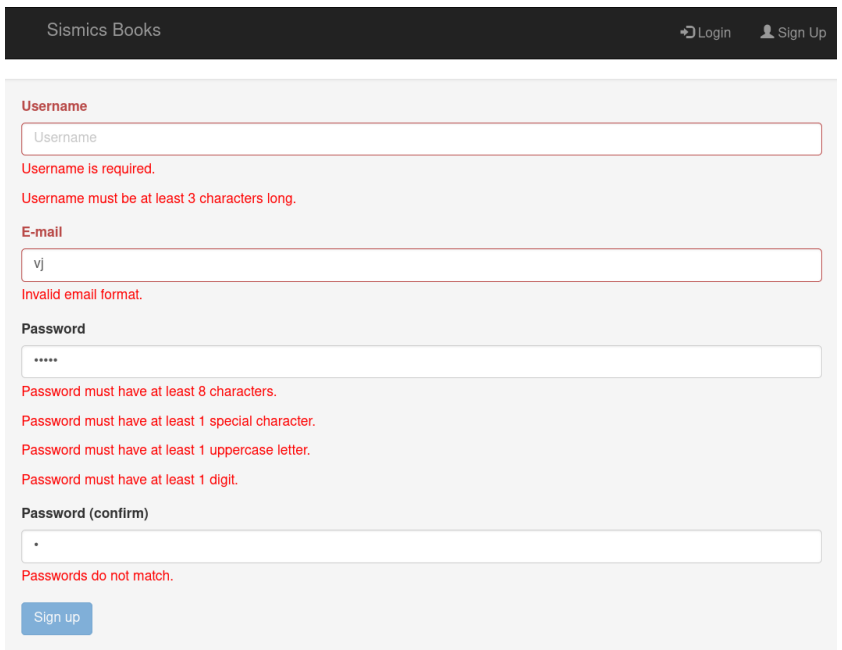
`UserHandler.java`

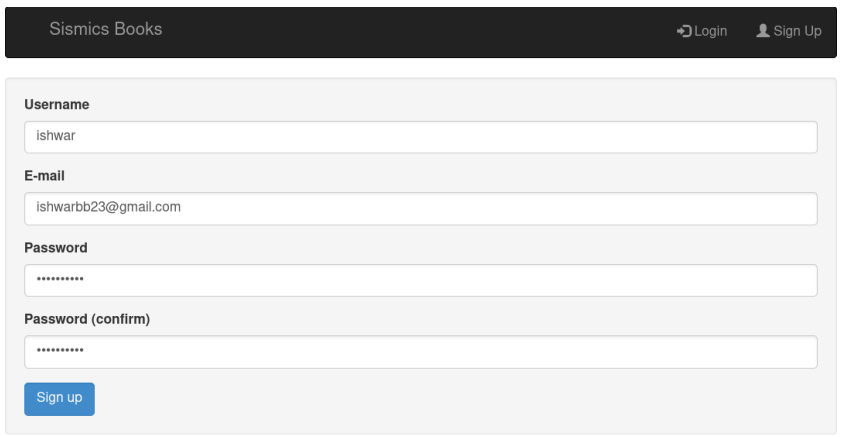
`ValidationUtil.java`

`passwordutil directory`

The APIs necessary for this functionality are handled in UserHandler.java. ValidationUtil Class and the files in passwordUtil directory are used for validation.

User Interface Pictures





Feature 2 : Common Library

Introduction

How about a common library system accessible to all users, allowing them to contribute books, rate existing books, and explore the library's collection!

Objective: Implement a common library accessible to all users for contributing and exploring books. This feature allows users to add books in a common library and rate the books.

Plan

Leveraging the documentatioin done in the previous assignment, the initial work comprised of designing new schemas for the necessary work. We added SQL statements and relations for libray books, ratings and genres.

Subsequently, we defined the DAO and DTO classes for all of the classes made and a criteria class for the library books (explained in the implementation details section). These classes were populated with the necessary attributes, getters, setters and other methods to retrieve relevant objects.

Finally, we defined several new API calls within the backend and conducted thorough API testing using Postman to make sure that our code logic and validation parameters were functioning aptly.

Meanwhile, the frontend was developed concurrently through making pre-defined API calls that returned dummy data.

Given the API calls, we planned to keep the UI consistent across all pages (including the ones which were defined earlier).

We initially planned to create three new pages. The first page will be defined by `library.html` and would show all the books in the common library in a bookshelf format. We also planned to add options to filter and rank books with the options specified in the project description here. On this page, there is also a button to add books to the common library, selecting on which the user will be redirected to the second page defined below.

The second page provided the user with the option to add a book to the library by giving the ISBN number of the book as an input. Since the project description did not provide explicit requirement pertaining to adding books in a specific format, we did this implementation based on our assumption, the user knows the ISBN of the book he/she wants to add. This page is defined by `library.addBook.html`

The third page will be defined by `library.bookDetail.html` which would show the details of a book when one is selected from the previously defined page. Here we planned to provide an option for the user to add genre and provide rating of the corresponding book. All validations were handled here.

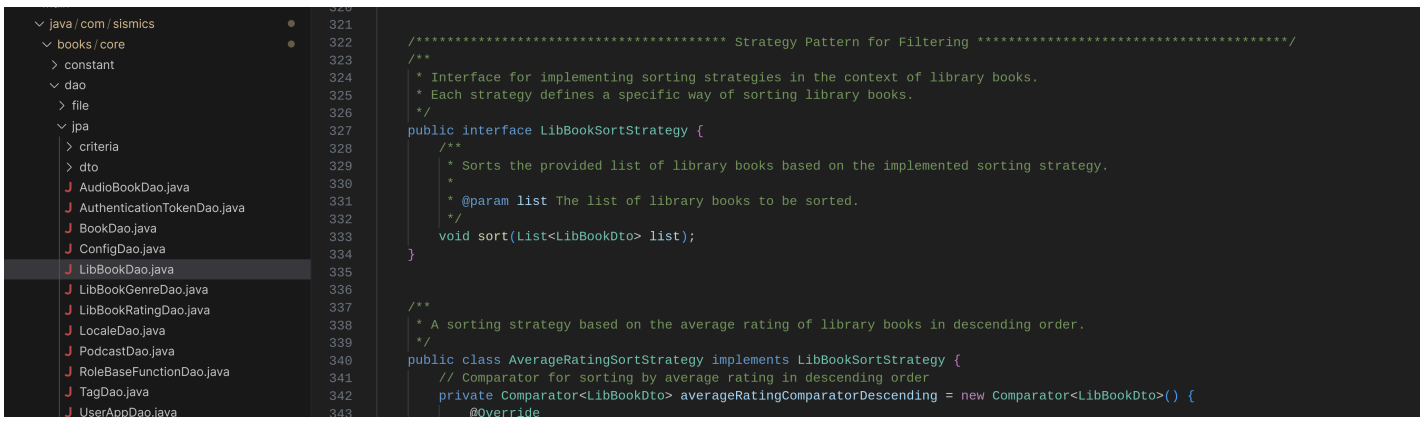
Design Patterns

Strategy Pattern

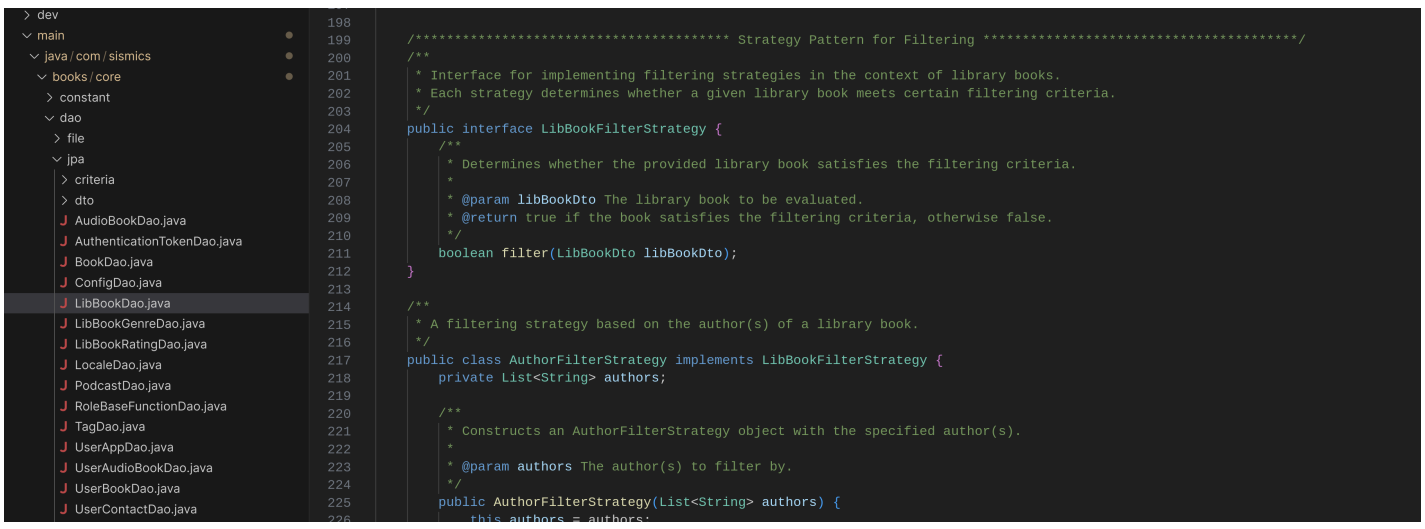
We've implemented two strategy patterns - the Sorting Strategy Pattern and the Filtering Strategy Pattern. These patterns are used to encapsulate algorithms within interchangeable components, allowing for flexibility and easy

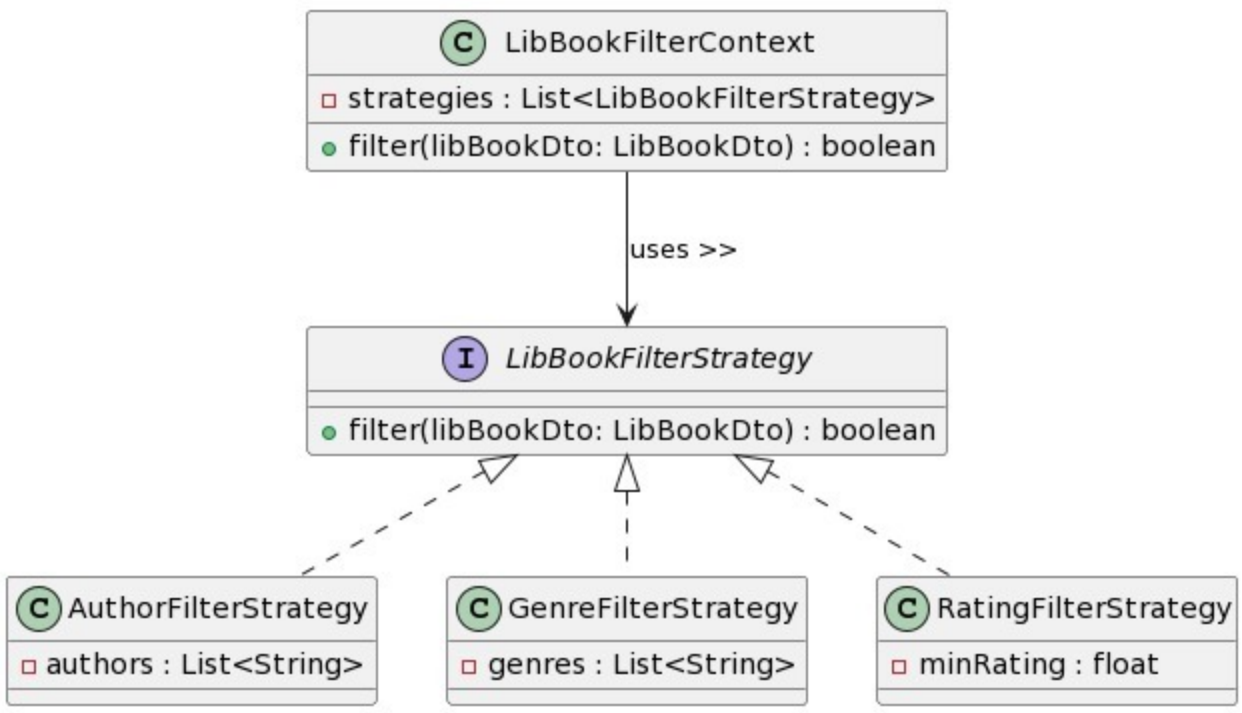
modification of behavior without altering the core logic.

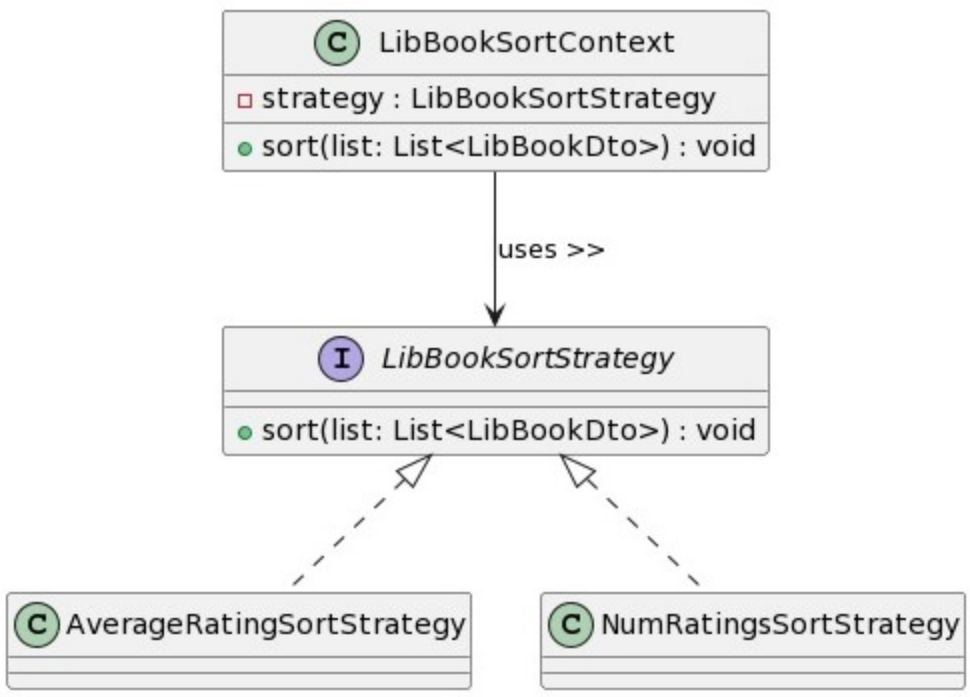
The Sorting Strategy Pattern comprises the `LibBookSortStrategy` interface, defining a common method for sorting a list of `LibBookDto` objects. Concrete sorting strategies, such as `AverageRatingSortStrategy` and `NumRatingsSortStrategy`, implement this interface, each encapsulating a specific sorting algorithm based on average rating and number of ratings, respectively. The `LibBookSortContext` acts as the context in which sorting strategies are applied, allowing for dynamic selection and execution of sorting algorithms. This pattern was implemented to decouple the sorting logic from the main `findByCriteria` code to p[romote reusability and maintainability.



Similarly, the Filtering Strategy Pattern encompasses the `LibBookFilterStrategy` interface, defining a method for determining whether a `LibBookDto` object satisfies certain filtering criteria. Concrete filtering strategies, such as `AuthorFilterStrategy`, `GenreFilterStrategy`, and `RatingFilterStrategy`, implement this interface, each encapsulating a specific filtering criterion based on author, genre, or minimum rating. The `LibBookFilterContext` acts as the context for applying filtering strategies, enabling the application of multiple filtering criteria to a single `LibBookDto`. This pattern was implemented to modularize filtering logic and enhance resuability in the event of new filtering logic.







Implementation Details

Front End

`library.html` **- Structure and Functionality:**

The `library.html` page serves as the main interface for users to interact with the library's collection. It's structured into several key sections:

1. **Add Book Button**: A link to navigate users to a page where they can manually add a new book to the library.
2. **Filter Books Button**: Users can filter the library's collection based on authors, genres, and ratings (multi-select supported).
3. **Rank Books Button**: Users can rank the books by average rating or by the number of ratings.
4. **Books Section**: Displays the books currently available in the library. Each book is shown with its cover image, title, and author. Clicking on a book navigates to its detailed view.

The page uses Angular directives such as `ng-click` for handling user interactions like toggling filters/ranking and navigating to book details, `ng-repeat` for dynamically listing books and genres, and `ng-if` for conditionally rendering sections based on the state (e.g., showing filters or ranking options).

`LibraryController.js` responsible for managing the state and interactions on the `library.html` page.

- The `fetchBooks()` function defined here constructs a query with specified queryParams with filters and ranking criteria selected by the user and calls the backend API (`library/list`) using Restangular. The books fetched based on these criteria are then stored in the `$scope.books` array for display. If ranking is applied, a limit is set to fetch the top 10 books.

`LibraryAddBook.js` is the controller for the page responsible to add books to the common library. We simply do a backend API call to add the entry to the table.

`LibraryBookDetailController.js` manages the interaction and state of a detailed book view in a library application. This controller is responsible for fetching detailed information about a specific book, allowing users to add genres to the book, and enabling users to rate the book. We have pre-defined the genres which can be added to a book to ensure integrity of the application and this is one of our assumptions.

Back End

We defined tables `T_LIB_BOOK`, `T_LIB_BOOK_GENRE` and `T_LIB_BOOK_RATING` within `books-core/src/main/resources/db/update/dbupdate-000-0.sql` and wrote the corresponding models within the `books-core/src/main/java/com/sismics/books/core/model/jpa` directory.

Further, we defined the DAO classes within `books-core/src/main/java/com/sismics/books/core/dao/jpa` and the corresponding DTO classes in `books-core/src/main/java/com/sismics/books/core/dao/jpa/dto` directory. Methods corresponding to deleting a book, creating a library book, getting a book by its ID were defined inside `LibBookDao.java` with corresponding codes for the ratings and genres being defined within the `LibBookRatingDao.java` and `LibBookGenreDao.java` files.

The `LibBookGenreDao.java` defined methods such as `getByBookIdAndName()` , `getByLibBookId()` and so on that are used to retrieve the `LibBookGenre` objects based on the given parameters. Similarly, we have functions that retieve specific objects or a class of objects `LibBookRatings.java` .

The `LibBookDao.java` also defines a `findByCriteria()` that takes in a list of author names, list of genre names and a minimum rating and uses strategy pattern to filter it as mentioned earlier - `LibBookFilterContext` . The function also does sorting based on the `LibBookSortContext` class.

We define the necessary APIs:

`AddLibBook` **API**

- **Path**: `/library`
- **Method**: PUT
- **Functionality**: Adds a new book to the library. It validates the provided ISBN, fetches book details (potentially from a public API if not found locally), and saves the book in the database. It also checks if the book is already added to the library to prevent duplicates.
- **Parameters**:
  - `isbn`: The ISBN of the book to add.
- **Authentication**: Requires user authentication to execute.

`AddLibBookGenre` **API**

- **Path**: `/library/genre`
- **Method**: PUT
- **Functionality**: Associates a new genre with a book in the library. It validates the existence of the specified library book and ensures that the genre is not already associated with the book.
- **Parameters**:
  - `libBookId`: The unique identifier of the library book.
  - `genreName`: The name of the genre to add.
- **Authentication**: Requires user authentication to execute.

`AddLibBookRating` **API**

- **Path**: `/library/rating`
- **Method**: PUT
- **Functionality**: Allows users to rate a book in the library. It ensures that the book exists and that the same user has not already rated the book. The rating value is expected to be within a specified range.
- **Parameters**:
  - `libBookId`: The unique identifier of the library book.
  - `userId`: The identifier of the user submitting the rating.
  - `rating`: The rating value.
- **Authentication**: Requires user authentication to execute.

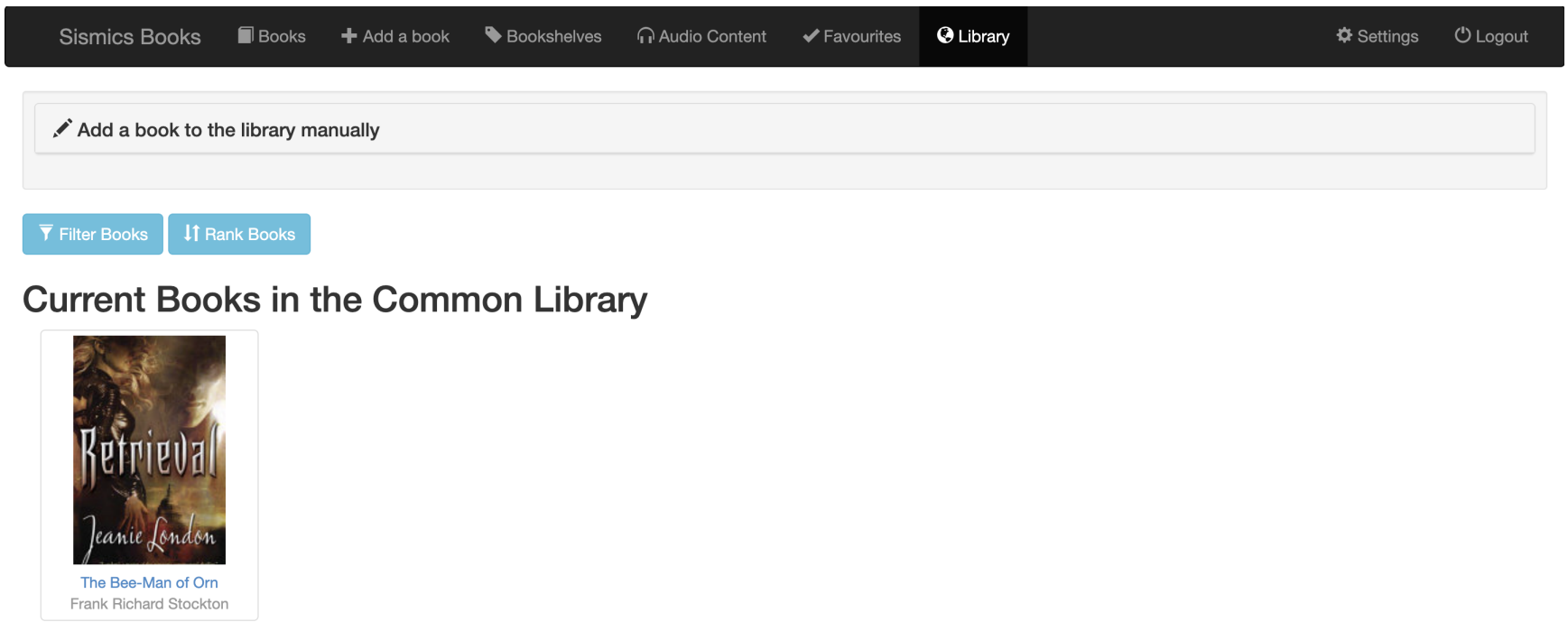
`ListLibBooks` **API**

- **Path**: `/library/list`
- **Method**: GET
- **Functionality**: Retrieves a list of books from the library, optionally applying filters for authors, genres, minimum ratings, and sorting criteria. It supports pagination through `limit` and `offset` parameters and allows sorting by average rating or number of ratings.
- **Parameters**:
  - `limit`, `offset`: Pagination controls.
  - `sort_column`, `asc`: Sorting controls.
  - `search`: A search query to filter books by title, subtitle, or author.

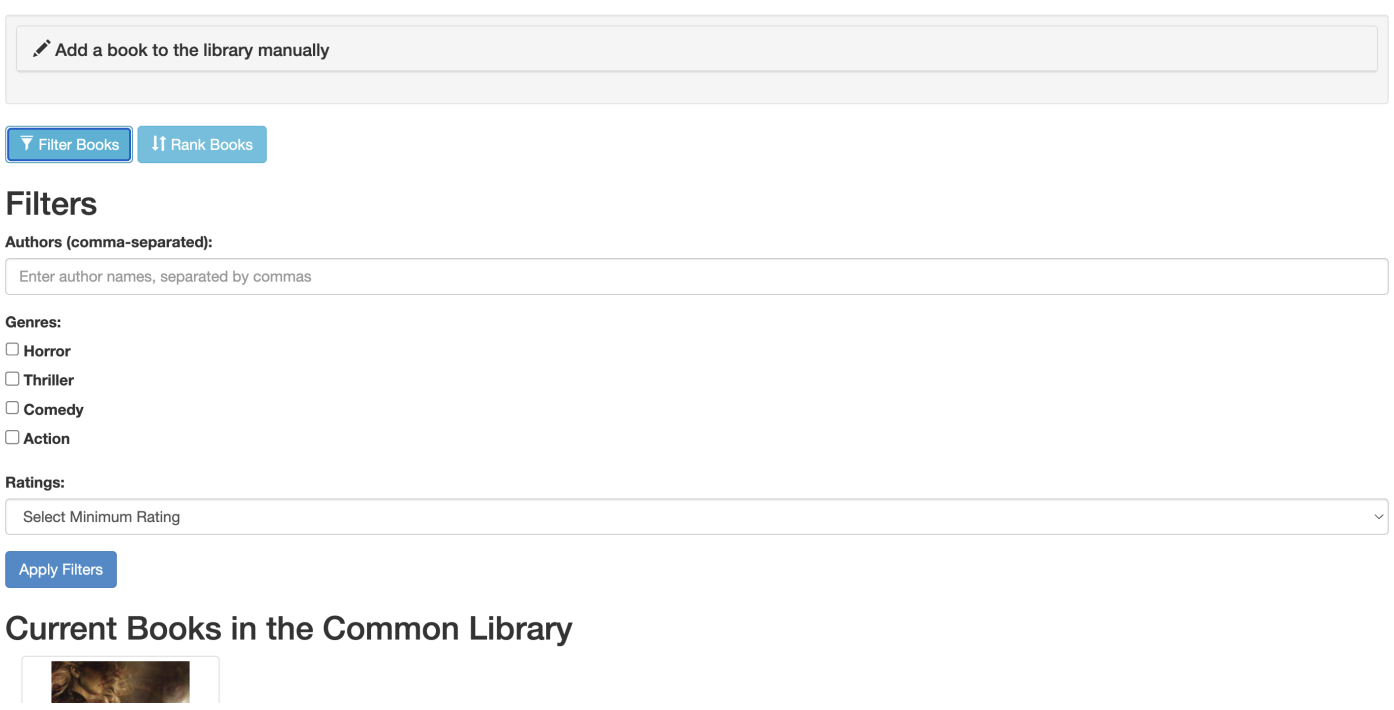
- `filter_authors`: Comma-separated list of author names to filter books.
- `filter_genres`: Comma-separated list of genres to filter books.
- `filter_min_rating`: Minimum rating filter.
- `library_sort`: Controls the sorting of books based on rating criteria.

- **Authentication**: Requires user authentication to execute.

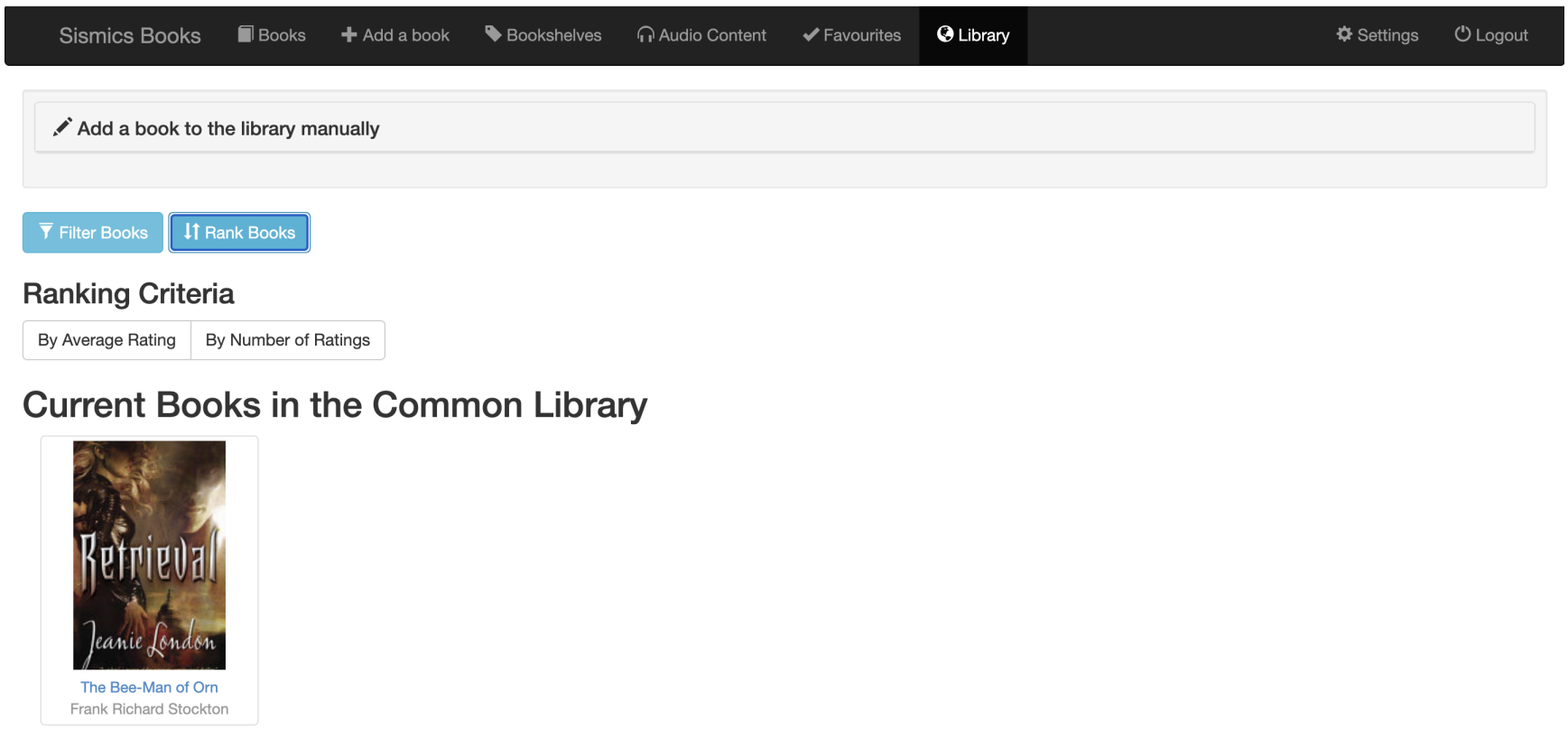
User Interface Pictures



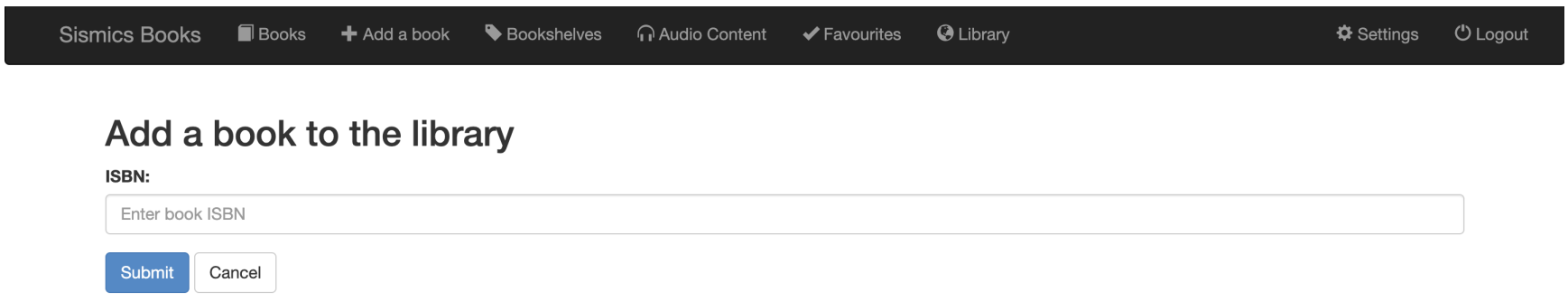
Option to filter the books present in the library:



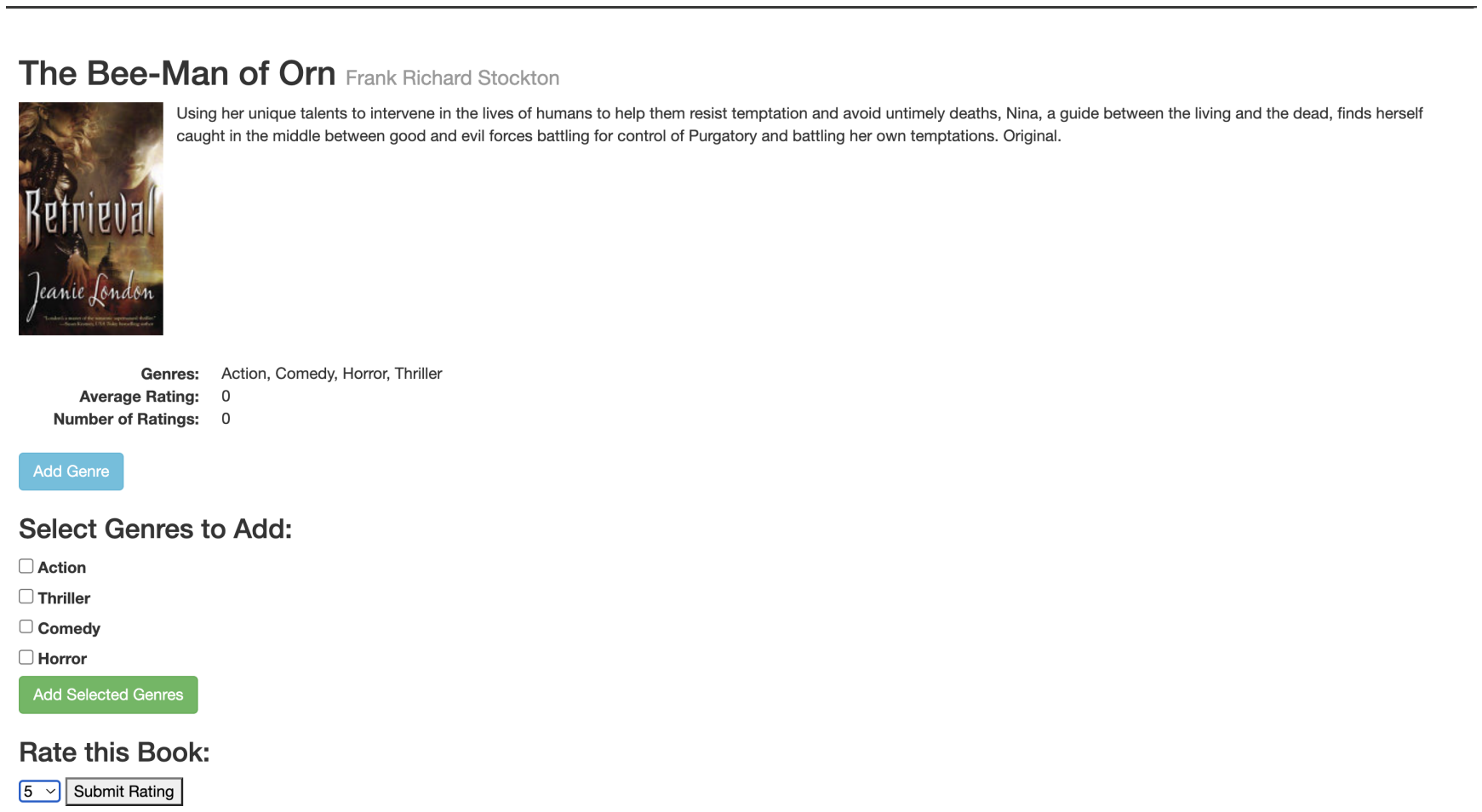
Option to rank the books present in the library:



Option to add books to the library:



Option to view book details, rate it on a scale (1-10) and add genres:



Feature 3 : Online Integration

Introduction

Ever wished your library could groove to your favorite tunes or narrate your go-to podcast? Say hello to our latest feature: integrating Spotify and iTunes right into our platform!

Objective: The primary objective of this task is to enhance the user experience by integrating the selection of Spotify or iTunes as service providers for accessing audiobooks and podcasts. This integration will empower users to choose their preferred service provider and content type seamlessly within the platform, thereby enriching their overall experience and expanding the platform's functionality

Plan

API Testing on Postman
During our development process, we conducted thorough API testing using Postman to understand and familiarize ourselves with the response contents and formats provided by Spotify and iTunes. We observed a key difference in the responses from these platforms:

- Spotify's responses lacked a description field, unlike iTunes.

Adapter Pattern Implementation
Due to the significant differences in the data structures of audiobook and podcast objects between iTunes and Spotify, we opted to create a common representation for both using the Adapter pattern. This decision facilitated easier handling and processing of data from both providers.

UI Design Decision: Mandatory User Selection before Search
We implemented a forced user selection step before initiating a search to prevent erroneous or incomplete requests. This step ensured that the necessary factories and configurations were set up correctly before making API requests, thereby reducing potential errors.

Direct Display of API Results and Ignoring Pagination
In our UI design, we prioritized displaying results directly as provided by the API responses. Since our focus was not extensively on frontend development, we decided to ignore pagination for simplicity and straightforwardness in displaying data.

Clickable Books and Consistency in UI
Clicking on a book item makes it 'alive' in the UI, allowing users to add it to their favorites seamlessly. This approach ensures consistency across the user experience and enhances UI smoothness.

Handling Book Addition on Click
When a user clicks on a book, we first add it to our database as a cached entry. This cached entry is not immediately added to the user's specific collections (like UserAudioBooks or UserPodcasts) but is stored in separate AudioBooks and Podcasts databases. This strategy minimizes database failures and optimizes performance.

Protection Against False Insertions
To maintain data integrity, we implemented safeguards to prevent any malicious or erroneous insertions into our databases, ensuring data reliability and security.

Displaying Favorites and UI Navigation
We dedicated a separate page for displaying user favorites, allowing easy navigation and toggling between audio book favorites and podcast favorites. This design simplifies browsing and enhances user experience.

Abstracting Service Providers
Our system abstracts away the differences between service providers, treating all audio content sources uniformly. This abstraction simplifies development and maintenance by encapsulating provider-specific details.

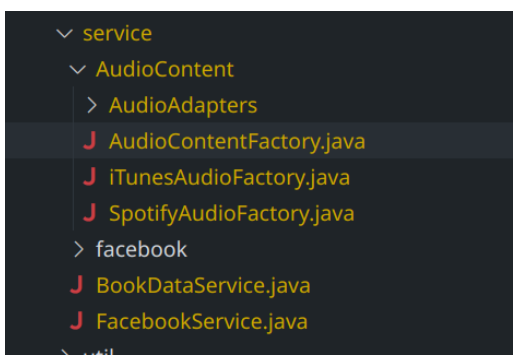
Direct Access to Favorite Content
Clicking on favorite books directly accesses the corresponding audio content, leveraging the pre-stored data and eliminating the need for redundant queries, thus optimizing performance and user experience.

Design Patterns

Factory Pattern

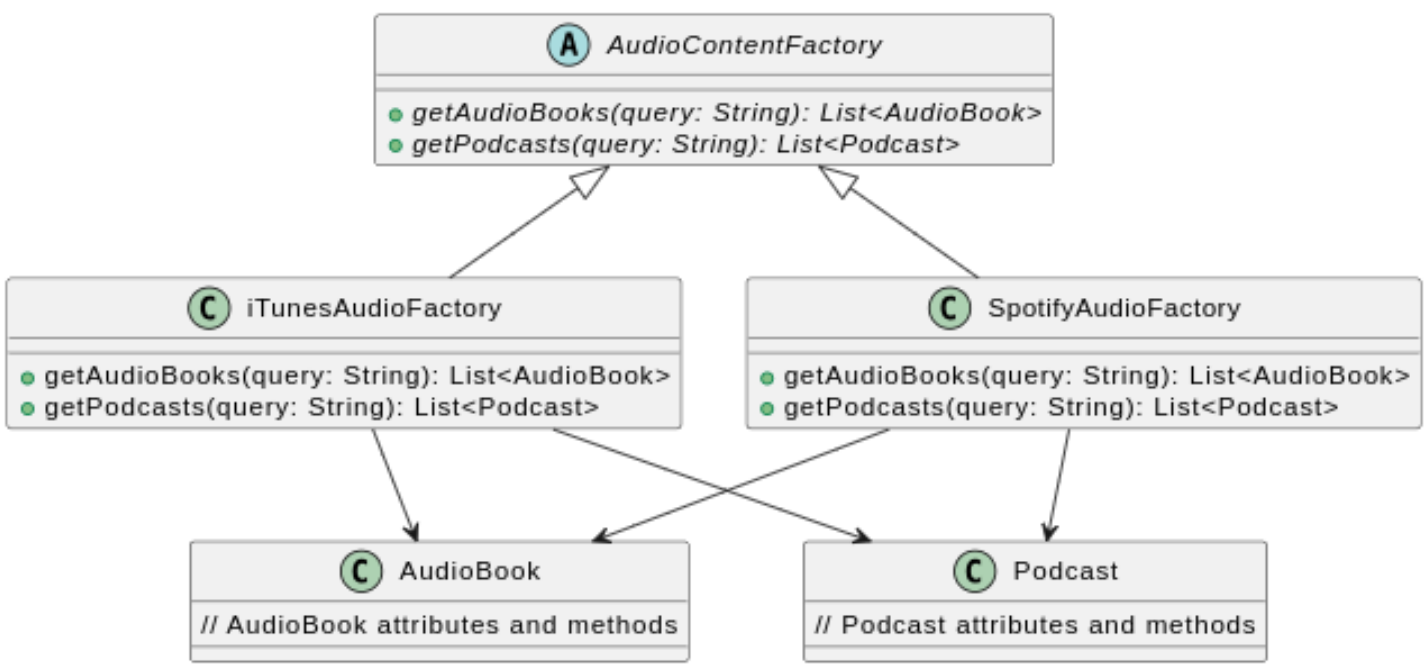
We have implemented the Factory Pattern in our codebase using the AudioContentFactory. This factory includes specific implementations such as iTunesAudioContentFactory and SpotifyAudioContentFactory. Depending on the requested service provider, we set the appropriate factory in the App Context. These factories are responsible for creating products such as podcasts and audiobooks.

Our primary focus with this pattern is on extensibility, allowing for easy integration of new service providers like Youtube Music in the future. The Factory Pattern facilitates the addition of new services seamlessly.



```
List<AudioBook> audioBooks = new ArrayList<AudioBook>();

try{
  AppContext.getInstance().setAudioContentFactory(provider);
  if (contentType.equals("audiobooks")) {
    AudioContentFactory  contentfactory = AppContext.getInstance().getAudioContentFactory();
    audioBooks = contentfactory.getAudioBooks(q);
  }
} catch (Exception e) {
  throw new ClientException(type:"No Audio Books found", e.getCause().getMessage(), e);
}
```



Adapter Pattern

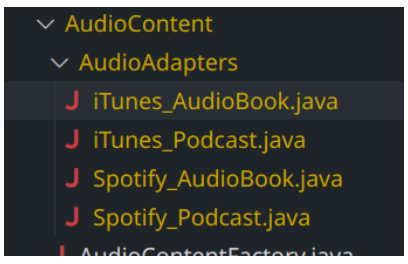
In addition to the Factory Pattern, we also utilize adapters to maintain a common data representation across the codebase. For instance, each service provider and content type has an adapter responsible for converting their respective objects into a common format. For example, an iTunes_Podcast adapter converts an iTunes Podcast object into a standardized object format used throughout the application. This approach ensures consistency and ease of data handling across different service providers and content types.

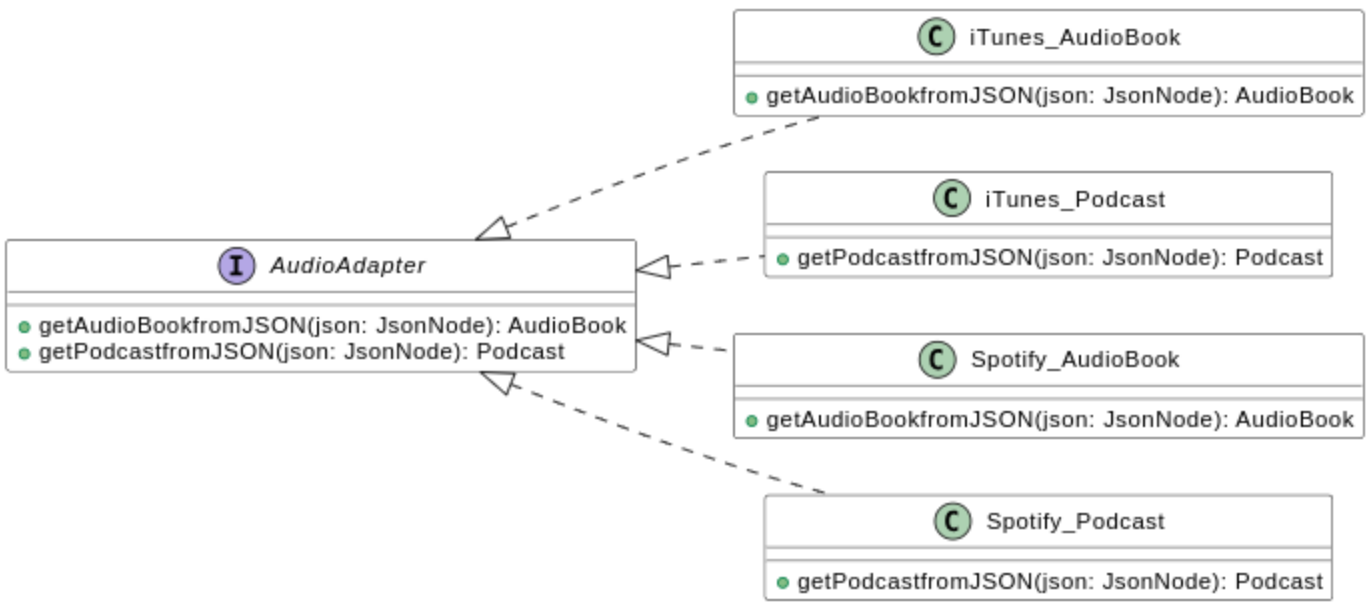
```java
public class iTunes_AudioBook extends AudioBook{
    public static final String ADAPTER_NAME = "iTunes_AudioBook";

    public AudioBook getAudioBookfromJSON(JsonNode json) {
        // Parse JSON and create AudioBook object
        String id = json.get(fieldName:"collectionId").getNumberValue().toString();
        String title = json.get(fieldName:"collectionName").getTextValue();
        String author = json.get(fieldName:"artistName").getTextValue();
        String description = json.get(fieldName:"description").getTextValue();
        String viewUrl = json.get(fieldName:"collectionViewUrl").getTextValue();

        AudioBook audioBook =  new AudioBook();
        audioBook.setId(id);
        audioBook.setTitle(title);
        audioBook.setAuthor(author);
        audioBook.setDescription(description);
        audioBook.setUrlLink(viewUrl);

        System.out.println("Audio Book ID : " + id);
        return audioBook;
    }
```





Implementation Details

Front End

HTML and JS files to search and display audio books, podcasts and favorites, And perform the necessary requests to the server to carry out the functionality.

- `audio.content.html`
  - `audiobookcontent.view.html`
  - `podcastcontent.view.html`
  - `favourites.html`
- `Audio.js`
- `AudioBookContentView.js`
- `PodcastContentView.js`
- `Favourites.js`

Back End

- `audiobookresource directory`
  - `AddAudioBook.java`
  - `FavouritesAudioBook.java`
  - `ListAudioBook.java`
- `podcastresource directory`
  - `AddPodcast.java`
  - `FavouritesPodcast.java`
  - `ListPodcast.java`
- `AudioContent directory` in service

- `AudioContentFactory.java`
- `iTunesAudioContent.java`
- `SpotifyAudioContent.java`

`AudioAdapters directory`

- `iTunes_AudioBook.java`
- `iTunes_Podcast.java`
- `Spotify_AudioBook.java`
- `Spotify_Podcast.java`

`model`

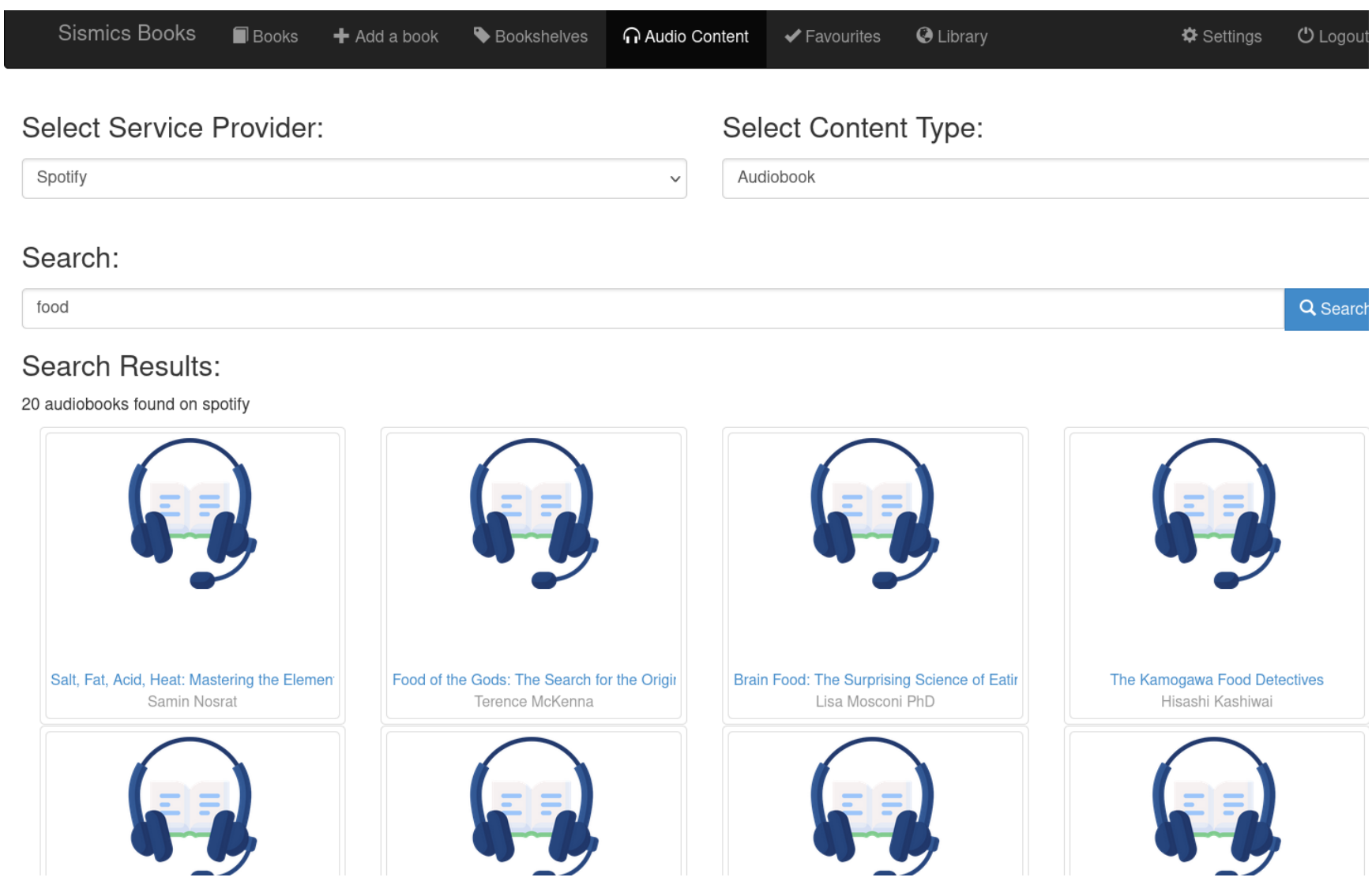
- `AudioBook.java`
- `Podcast.java`
- `UserAudioBook.java`
- `UserPodcast.java`

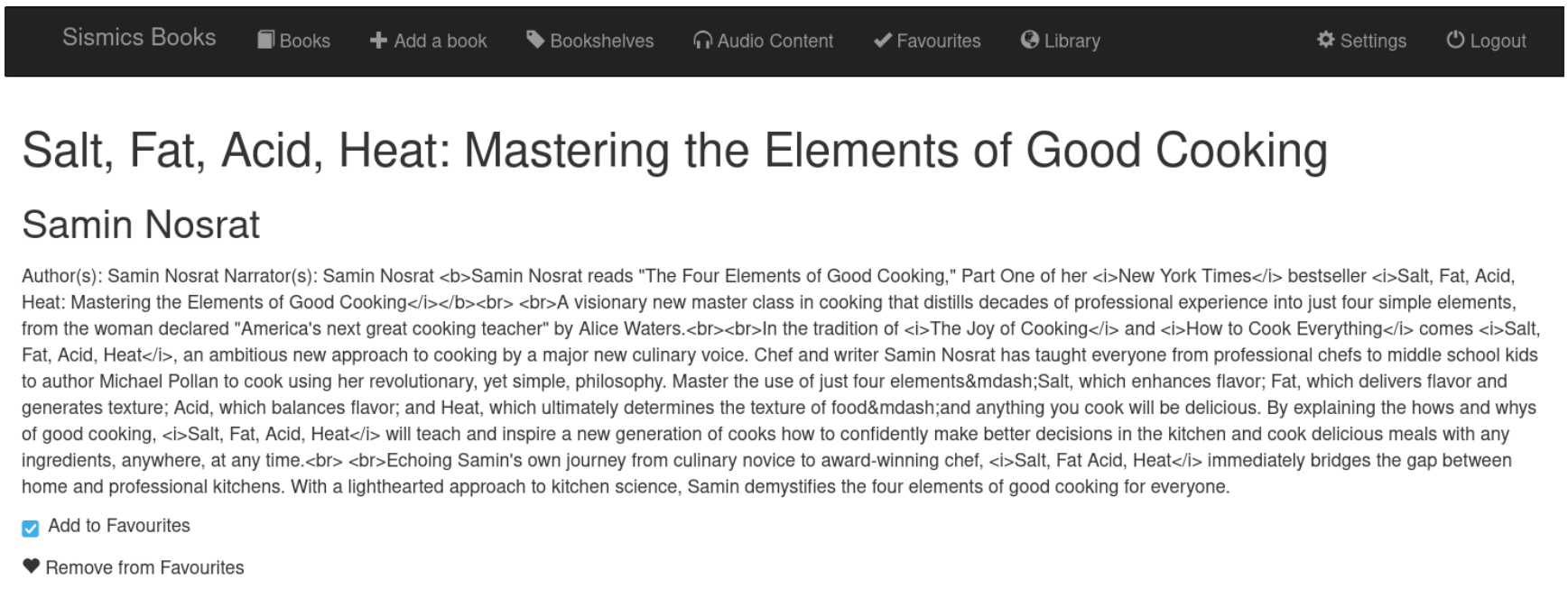
`dao`

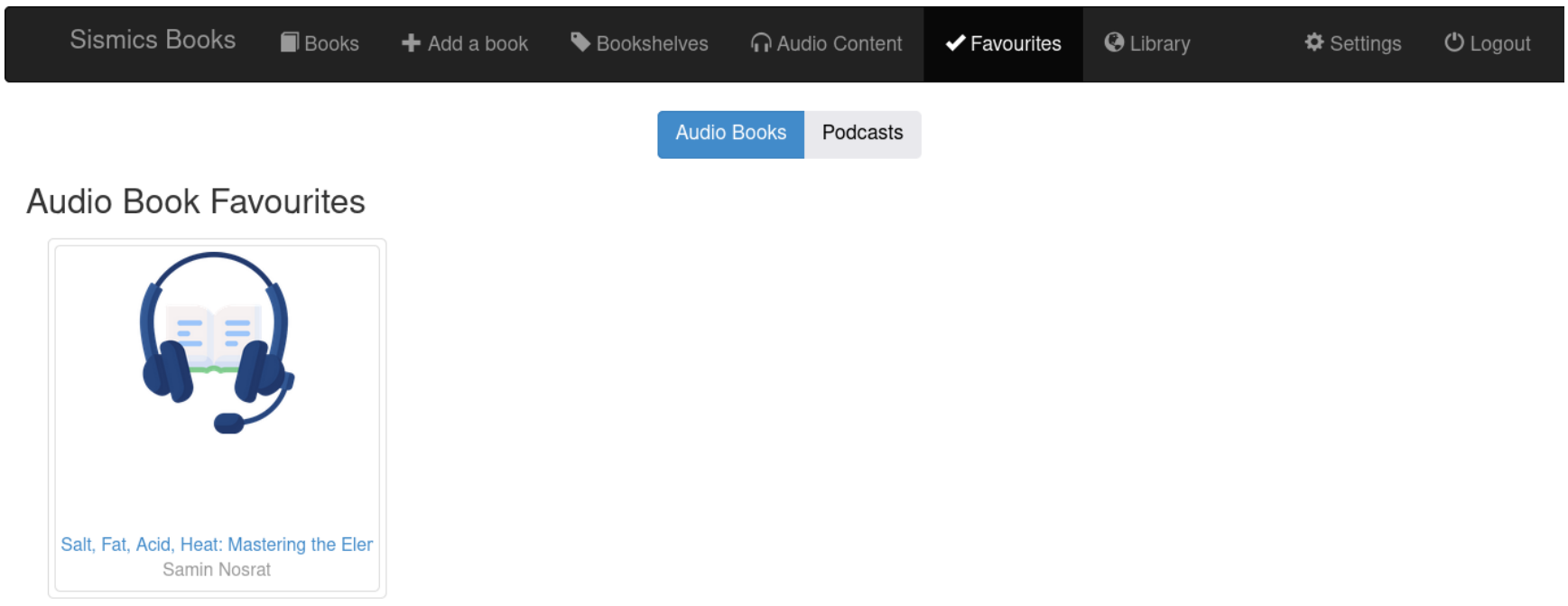
- `UserAudioBookDao.java`
- `UserPodcastDao.java`
- `AudioBookDao.java`
- `PodcastDao.java`

and corresponding `dto`s

User Interface Pictures







Note - We have done the detailed documentation of changes in some of classes that can be referred to here.