

OOP Big Assignment Part 2

Description of the task:

The university library management system maintains a diverse collection of items and facilitates borrowing and returning processes for members.

Items, have an id, a title, an author, page count, topic. The system tracks how many times an item has been borrowed. The item could be one a book, thesis, or research paper. Each item might have multiple copies and new copies can be added. If an item is borrowed, and there are more copies, it should still be available for others to be borrowed; if all copies were borrowed then it would not be available. When returning an item, it would be available for borrowing again if not damaged. A book could get damaged due to misuse and when returning it should be marked as damaged or not, if it's damaged the item needs repair and a repair must be requested.

An item can have a digital copy. By default the item wouldn't have one, but it can be created. When created, it would have same id as the item. Members can view the item, and if they want they can download the digital copy. The number of views and downloads is kept. The library should be able to find most viewed and most downloaded items.

To borrow items, users must be members of the library, they have their own id, name, email, and they have a category of student, faculty, or alumni. Each user keeps an active list of currently borrowed items and initially it should not exceed 3 per member. They should also keep the number of total borrowed items (when a book is successfully returned, then it is added to the list). For each 3 items that are returned, the member's loyalty would be appreciated by increasing the number of allowed items. However, to be able to consider a return of an item as a loyalty point, the condition of the item should be marked as preserved (not damaged).

The Library has a Repairs Section. It keeps count each time an item is sent to be repaired. If damage is severe (use randomness) then the book should be removed from the library to the archives of the library. If successfully repaired then it would normally be back to be available. The Library does a periodical check every now and then to send the items that need repair to repair Section, and to do the repair process.

The library stores the collection of items, It also tracks active transactions (borrowing and returning) and provides search functionalities by title and author to help users locate desired materials. The Library can add new items to its collection and manages the borrowing and returning of items. The library also keeps track of all their members, and can search for most active members. Also the people can find most popular items based on the number of times they have been borrowed: the most popular digital item, and the most popular in general taking in account both physical and digital copies.

The main simulation must initialize the Library. Create items and add them to the library. Some items might have digital copies. Create members and make borrowing and returning transactions and other

necessary operations such as searching for specific items, or making repairs. Read the input from a file, and use as many input files as needed.

Input file examples

items.txt

- Format

ID Title Author Page_Count Topic Type Copies

- Sample input

```
1 Clean_Code Robert_C_Martin 464 Software_Engineering Book 3
2 The_Pragmatic_Programmer Andrew_Hunt 352 Software_Engineering Book 2
3 Design_Patterns Erich_Gamma 395 Software_Engineering Book 2
4 Refactoring Martin_Fowler 448 Software_Engineering Book 3
```

members.txt

- Format

ID Name Email Category

- Sample input

```
1 Bence_Nagy bence@elte.hu Student
2 Eszter_Kovacs eszter@elte.hu Faculty
3 John_Smith john@elte.hu Alumni
4 Levente_Toht levente@elte.hu Student
5 Sophia_Martinez sophia@elte.hu Faculty
```

Additional Functionality:

As the university library evolves to support a wider variety of materials, borrowing behaviors and system decisions now adapt based on the nature of each item and the circumstances of the request. Members still interact through a unified interface, but behind the scenes, the process unfolds differently depending on the item type.

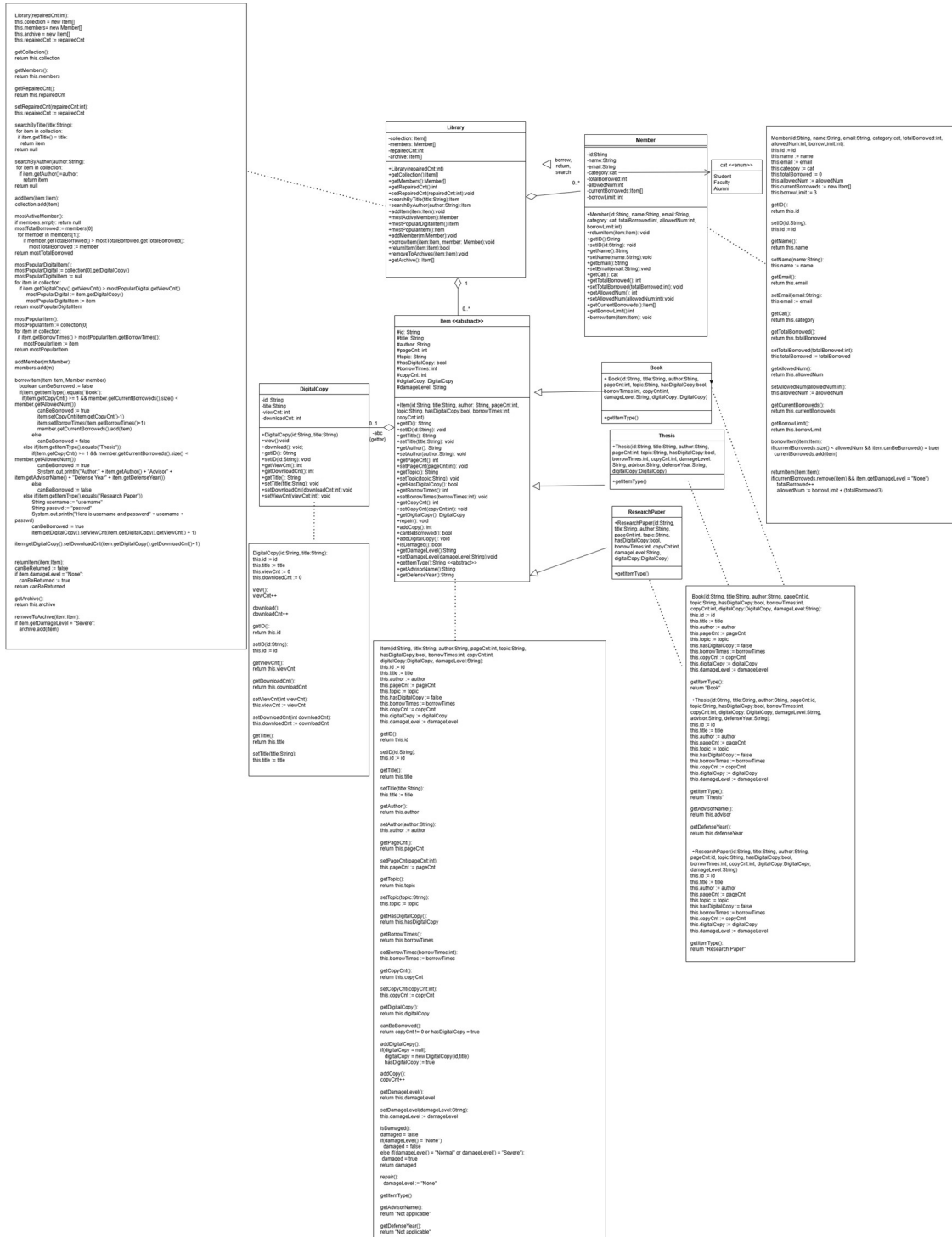
Books remain the most common item for borrowing. When a book is requested, the system checks for available physical copies. If at least one copy exists, the book is lent to the member, and both the item and member records are updated. If all copies are out, the book is marked as unavailable for others until a return occurs.

Theses are handled with similar rules to books. However, they are typically rarer, often with just one physical copy. While they can still be borrowed, no digital copies are produced. Their data include

author, advisor, and defense year — is retained for academic referencing but does not influence borrowing logic.

Online Research Papers are not physically borrowed. When a member requests one (tries to borrow), the system prepares a digital access instance. The paper is immediately made available, regardless of how many others are viewing it. Each access is recorded as a view, and if the member chooses to download it, the system logs the download and increments the usage count.

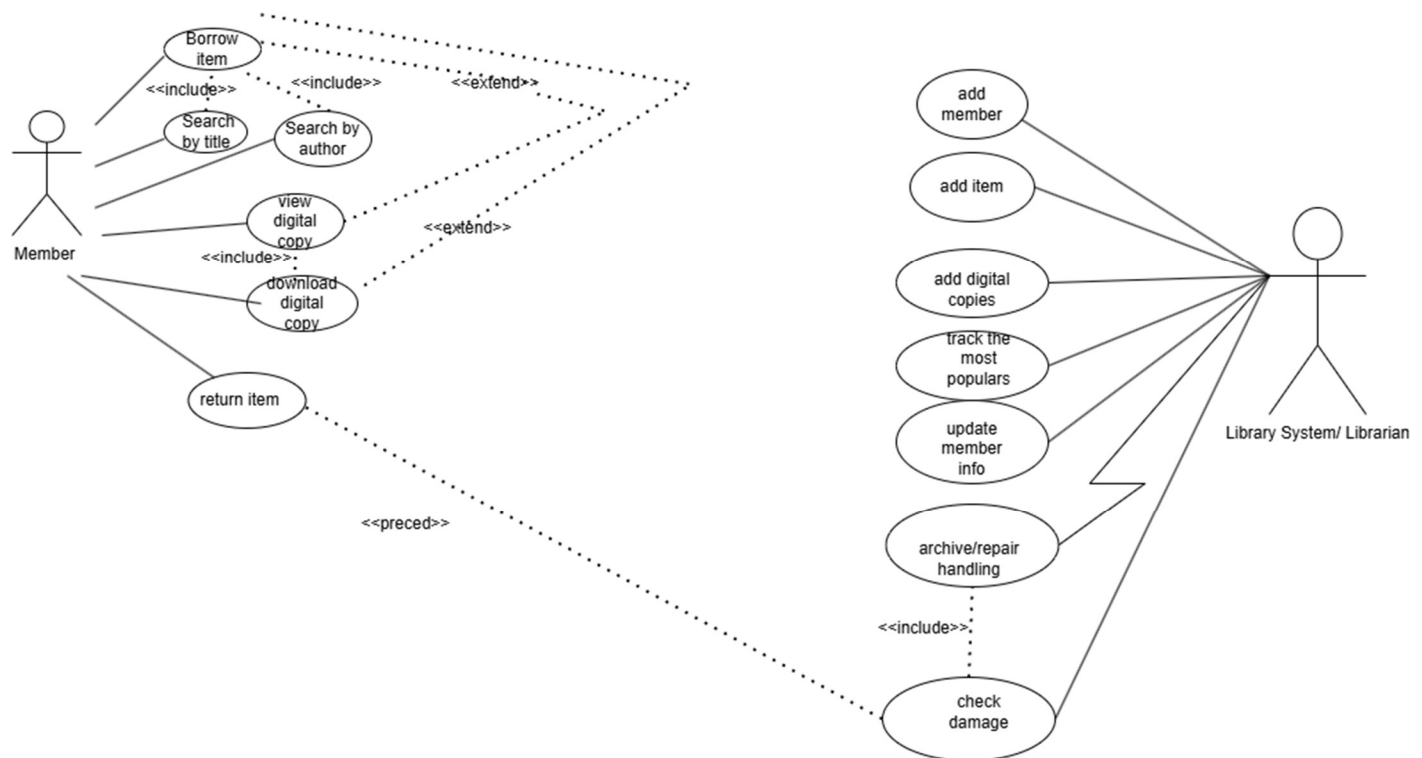
Extended Class Diagram



Link to the class diagram:

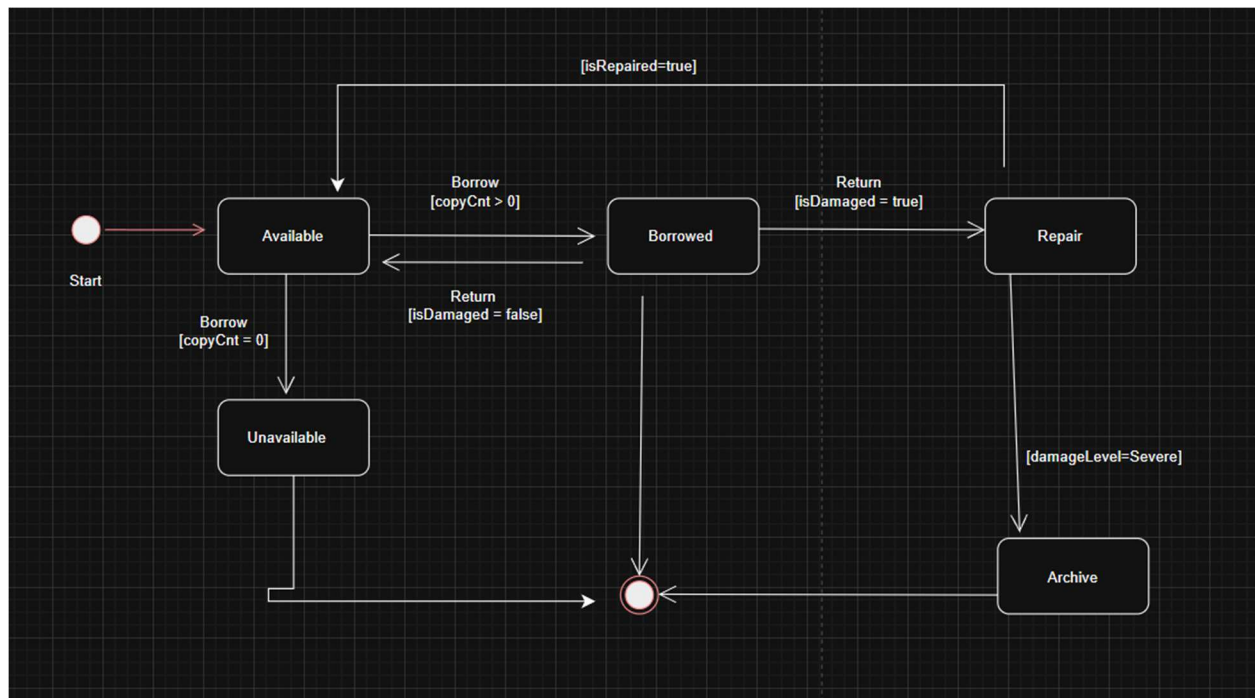
https://drive.google.com/file/d/1mVISIjSHWL76g8X8TrOHBrG_rpxE4Fv3/view?usp=sharing

Use-case diagram:



State Diagram:

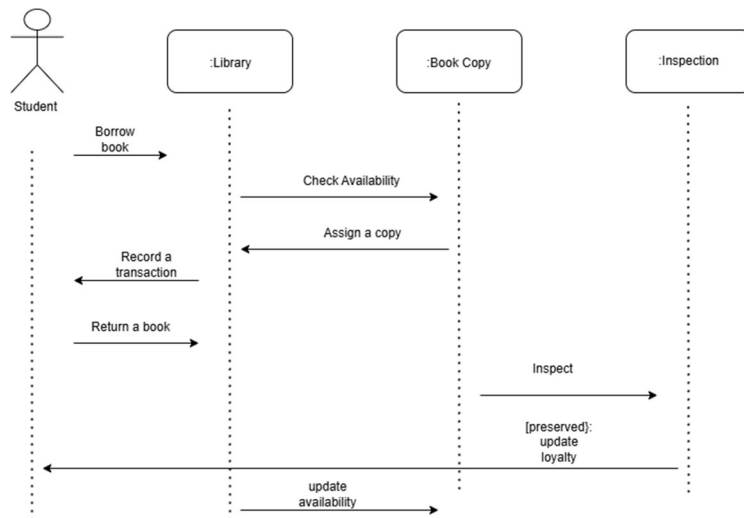
The state diagram for an Item in the University Library Management System captures the dynamic transitions between various states. Initially, an item is in the Available state, indicating that it can be borrowed. When a member borrows it, the item transitions to Borrowed, but only if there are available physical copies. If all copies are borrowed, it moves to Unavailable. Upon return, if the item is marked as Preserved, it returns to the Available state; however, if returned as Damaged, it transitions to a Needs Repair state. From there, the item either proceeds to the Being Repaired state or, if deemed severely damaged (based on a probabilistic condition), transitions to Archived, permanently removing it from circulation.



https://drive.google.com/file/d/1_Pa3K6c2r7guODNwQej5Na1dKk9e2nW8/view?usp=sharing

Sequence Diagram Scenario 1:

A student borrows a book with multiple copies in circulation. The system verifies availability, assigns a copy to the student, and records the transaction. Upon return, the book is inspected and marked as preserved, incrementing the student's loyalty progress. The book becomes available again.



Sequence Diagram Scenario 2:

A faculty member returns a thesis copy in damaged condition. The system flags the item and sends it to the repair process. After evaluation, the damage is deemed irreversible. The thesis is removed from borrowing circulation and marked as archived.

