**Homework 4**

**COM S 362**

**Fall 2021**

You are given the following description and two use cases of a library which are to be used to perform a domain analysis.

**Library Description**

A Library has a set of books, and a set of media. Audiobooks, DVDs, CDs are all included in the media the library provides. Both the set of books and the set of media are included in the library’s catalog, which is managed by librarians. Librarians need to be able to add new resources to the catalog as well as remove resources in case something gets lost or stolen. Additionally, they need to be able to order new resources if a new book or media item is released.

Patrons of the library also need to use the system in a variety of ways. First, they must register for a library card with a librarian. After registration, a patron can perform a variety of different tasks. They must be able to check out a resource which they can do with a librarian or at a kiosk. They may also pay any late fees at a kiosk or with a librarian. If their late fees exceed $5.00, they are required to pay some of their fine before checking out any additional resources.

Librarians are responsible for maintaining accurate records. Patrons’ registration information is maintained in a document called the borrowers register. A circulation ledger is used to record and track loaned resources. The library has a bookkeeper that tracks late fees in a document called accounts receivable.

Sometimes patrons cannot find what they’re looking for in the library so they will want to be able to search the catalog for a specific resource. Sometimes a book or media item will be in the catalog, but all the copies will be out of stock. In this case a patron might want to put a hold on an item which they would do by interfacing with the librarian.

While interacting with a librarian or kiosk, patrons can also see due dates of resources that they currently have checked out. If desired, they may renew these materials before the due date. If they brought a book or media item back to the library with them, then they can return those resources in one of the drop slots. Librarians are responsible for checking these items back in and putting them back in their proper location.

**Use Case Name:** Check out Resource

**Primary Actor:** Patron

**Triggering Event:** Patron decides to borrow a particular resource. **Stakeholders and Interests:**

* Patron: Wants to use the resource outside of the library.
* Librarian: Wants to assure patron is satisfied and that resources are properly tracked.
* Library: Wants to make sure resources are being properly tracked.

**Preconditions:**

* Librarian is authorized to check out the resource.
* Patron is an authorized library user (has a valid library card).
* Patron’s borrowing privileges are not restricted (especially, patron does not owe excess late fees).
* The resource is available and eligible for loan.

**Success Guarantee**: Patron leaves with the loaned resource and the loan is properly recorded in the system.

**Main Success Scenario:**

1. Patron locates the resource (see sub scenario).
2. Patron goes to the front desk.
3. Patron presents the resource and their library card to an available librarian.
4. Patron advises librarian they wish to check out the resource.
5. Librarian enters patron’s identification information from the card.
6. Librarian enters resource identification information.
7. System confirms the resource loan is not prevented by restrictions on either the patron’s borrowing privileges or on the resource.
8. System computes a due date and records the loan in the circulation ledger.
9. Librarian informs Patron of the due date and returns the resource.
10. Patron leaves with the loaned resource.

**Use Case Name:** Pay Late Fees

**Primary Actor:** Patron

**Triggering Event:** Patron visits library to pay fees. **Stakeholders and Interests:**

* Patron: Wishes to reduce their current late fee balance.
* Library: Wishes to keep receivables current.
* Bookkeeper: Wishes to maintain accurate record of accounts receivable.

**Preconditions:** Patron is registered as a library user and has their library card.

**Success Guarantee**: Patron makes payment and their account balance is reduced appropriately. **Main Success Scenario:**

1. Patron approaches an available librarian.
2. Patron requests to pay late their late fees.
3. Librarian obtains the patron’s id information.
4. Librarian looks up patron’s account to find fee balance.
5. Librarian shares balance information with patron.
6. Librarian asks patron how much they want to pay.
7. Patron tenders desired payment.
8. Librarian receives payment.
9. Librarian records payment information in the system.
10. System records payment in accounts receivable and adjusts patron’s fee balance.

1. **(20 points)** Create a list of at least 12 candidate classes (conceptual classes) from the provided analysis artifacts. Provide only the class names, no additional details required.
   1. **AccountRecievable**
   2. **In circulation**
   3. **BrowersRegister**
   4. **LibraryAccount**
   5. **Kiosk**
   6. **ReturnItems**
   7. **PayFees**
   8. **RenewItems**
   9. **HoldItem(s)**
   10. **OrderItems**
   11. **UpdateCatalog**
   12. **Catalog**
2. **(30 points)** Select a total of 6 candidate classes you think are important for modeling the supplied use cases. Using the card template provided below, complete CRC cards for each candidate class. The detail on the CRC cards should be sufficient to perform a simulation of both use cases. Collaborators may include classes not shown on CRC cards.

|  |  |
| --- | --- |
| Class: **PayFees** |  |
| Responsibilities:   1. Validate Payment 2. Library interface Knowledge 3. Price of Fees | Collaborators:   1. Card reader/ Cash Register 2. Librarian 3. Patron   … |

|  |  |
| --- | --- |
| Class: Kiosk |  |
| Responsibilities:   1. Check items out 2. Give/get user information 3. Validate patron doesn’t have to pay fees 4. Librarian with check out item information   … | Collaborators:   1. Librarian 2. Patron 3. Cash register/ Card Reader… 4. Item being checked out |

|  |  |
| --- | --- |
| Class: **AccountsRecievable** |  |
| Responsibilities:   1. Keep track of late fees 2. Hold account if late fees > $5 3. Patron information   … | Collaborators:   1. Brower’s register 2. Librarian   … |

|  |  |
| --- | --- |
| Class: **Catalog** |  |
| Responsibilities:   1. Look up item 2. Display item availability 3. Display item location   … | Collaborators:   1. Patron/Librarian 2. OrderItems 3. UpdateCatalog 4. isCheckedOut/Cirrculation   … |

|  |  |
| --- | --- |
| Class: **Brower’s Register** |  |
| Responsibilities:   1. User look up information 2. Items user has check out 3. Due date of items   … | Collaborators:   1. isCheckedOut 2. AccountsRecievable 3. Librarian 4. CreateAccount   … |

|  |  |
| --- | --- |
| Class: **InCirculation** |  |
| Responsibilities:   1. Update the catalog item count 2. Update patron checked out information 3. Give due date   … | Collaborators:   1. Librarian 2. Patron 3. Items to check out 4. AccountsRecievable   … |

1. **(30 points)** Create a domain model diagram. There is no exact number of classes that need to be included, it must be complete enough to simulate all relevant aspects of both use cases. The diagram must be “fully dressed”, meaning it must include class names, attributes, associations and multiplicities. Follow the style and guidelines outlined by Larman in the reading. Use Figure 9.27 “NextGen POS partial domain model” as an example. Hand drawn is acceptable for this problem, if you want to use software: UMLet and diagrams.net are good options.

Diagram

Description automatically generated

1. **(20 points)** Begin planning the transition to the design model by completing the following.
2. Pick one class where one or more responsibilities have been assigned based on the GRASP pattern for Information Expert. Complete the following template.

Class Name: kiosk

Responsibilities:

* + help patron check out – kiosk is the Information Expert because it is the database/Interface that allows the patron to check out a book
  + provide patron with fees – Kiosk is the Information Expert because it holds the borrowers register which shows the fee information on a given account
  + Search item – Kiosk is the information expert because it holds the catalog which gives information on where an item in the library could be found or if there are any copies left
  + Validate check out – Kiosk is the information expert because it holds accounts receivable, and the borrower register which gives information on the fees on a said account

…

1. Pick another class where one or more responsibilities have been assigned based on the GRASP pattern for Creator. Complete the previous template.

Class Name: **Update Catalog**

Responsibilities:

* Add items to Catalog – update catalog is the Creator because items (audio, video, books, magazines, etc) are created and then add to the catalog
* Remove items from Catalog - update catalog is the Creator because items (audio, video, books, magazines, etc) are deletes and then removes it from the catalog
* Increase/decrease number of copies – update catalog is the Creator because it determines how many of each object/item there are for patrons to check out

1. Pick another class where one or more responsibilities have been assigned in a way that reduces coupling. Complete the previous template.

Class Name: Order Items

Responsibilities:

* Search store for items – order items have low coupling because it doesn’t need to know or imply what way the inventory of a store will be searched (with store associate vs online)
* Purchase items – order items have low coupling because it doesn’t need or imply where the purchase was made online versus in the store or the type of payment (cash vs card)

1. Pick another class where one or more the responsibilities have been assigned in way that increases cohesion. Complete the previous template.

Class Name: Catalog

Responsibilities:

* Look up item – Catalog has high cohesion since all the items it will be looking up are library items that won’t change (audio, video, books, magazines, etc)
* New item to Catalog – Catalog has high cohesion because the only items it has to account for when adding to the catalog are library items
* Remove item from Catalog – Catalog has high cohesion because the only items it has to account for when removing from the catalog are library items
* See item in circulation - Catalog has high cohesion because when it gets information from the in circulation class/database it only deals with library items which allows like elements, concepts and ideas to be coupled/paired together.