

- 1) Classes needed to solve this problem and their purpose:

Data definition class – Library

This class will create the Library object as well as instantiate all of its variables. It will also aid the implementation class in accessing, mutating, and printing any info generated within the object. It will be used as an aggregator for LibraryItem and Librarian.

Data definition class – LibraryItem

This class will create the LibraryItem object as well as instantiate all of its variables. It will also aid the implementation class in accessing, mutating, and printing any info generated within the object. It will be used as a parent class for Book and DiscMedia.

Data definition class – Book

This class will create the Book object as well as instantiate all of its variables. This will be done by way of sending LibraryItem variables to the superclass LibraryItem with a super key and then setting additional variables specific to the Book subclass. It will also aid the implementation class in accessing, mutating, and printing any info generated within the object.

Data definition class – DiscMedia

This class will create the DiscMedia object as well as instantiate all of its variables. This will be done by way of sending LibraryItem variables to the

superclass LibraryItem with a super key and then setting additional variables specific to the DiscMedia subclass. It will also aid the implementation class in accessing, mutating, and printing any info generated within the object.

Data definition class – Librarian

This class will create the Librarian object as well as instantiate all of its variables. It will also aid the implementation class in accessing, mutating, and printing any info generated within the object.

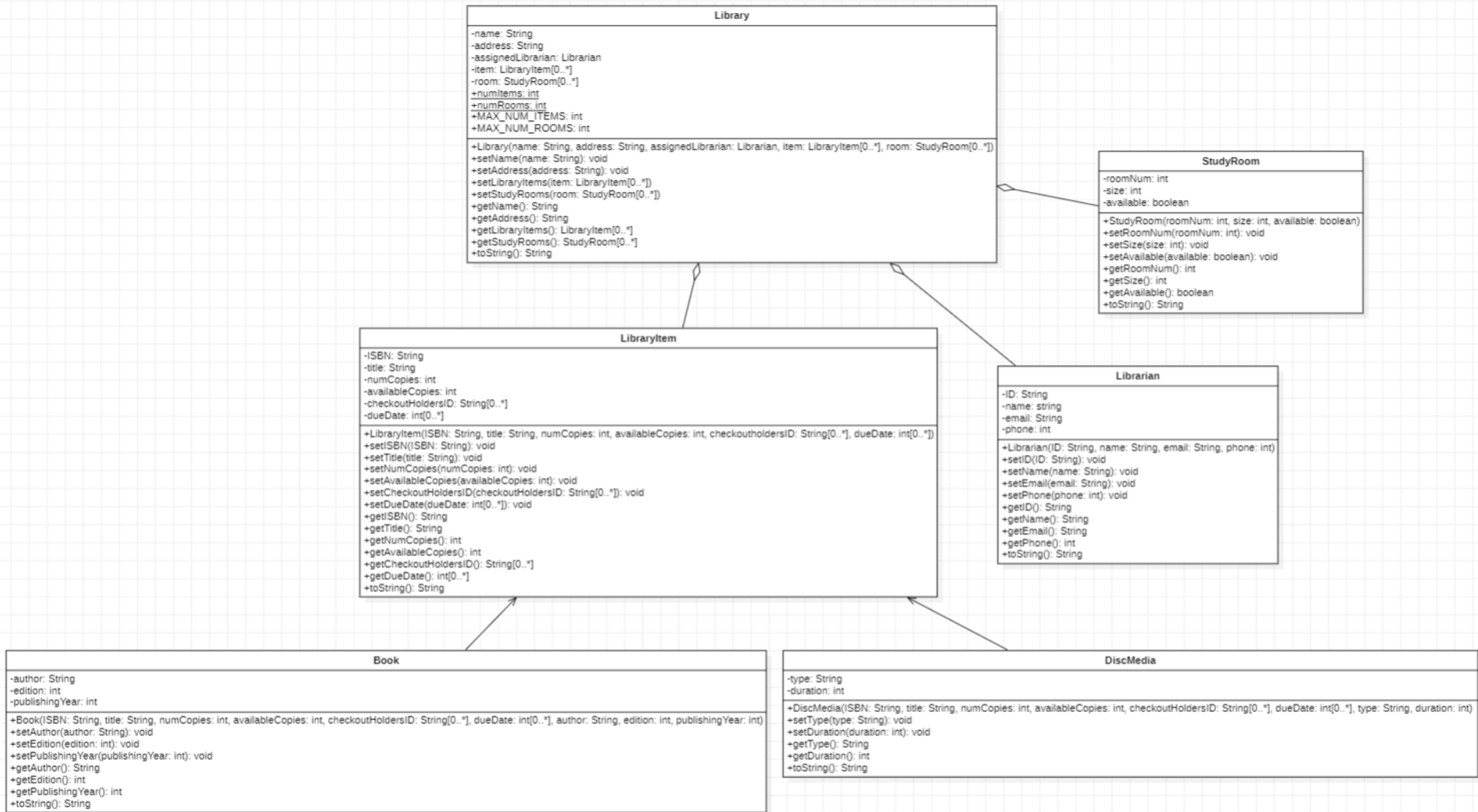
Data definition class – StudyRoom

This class will create the StudyRoom object as well as instantiate all of its variables. It will also aid the implementation class in accessing, mutating, and printing any info generated within the object.

Implementation class – CheckoutSystem

This class will prompt the user with a menu of choices including the option to add a library, add a librarian, add library items, add study rooms, search library items, checkout books, reserve study rooms, and print library information. It will also include methods related to each of these tasks that will communicate with the DDCs in order to manipulate items in the library.

2) Data Definition Classes: UML diagram



Classes:

Library
-name: String -address: String -assignedLibrarian: Librarian -item: LibraryItem[0..*] -room: StudyRoom[0..*] <u>+numItems: int</u> <u>+numRooms: int</u> <u>+MAX_NUM_ITEMS: int</u> <u>+MAX_NUM_ROOMS: int</u>
+Library(name: String, address: String, assignedLibrarian: Librarian, item: LibraryItem[0..*], room: StudyRoom[0..*]) +setName(name: String): void +setAddress(address: String): void +setLibraryItems(item: LibraryItem[0..*]) +setStudyRooms(room: StudyRoom[0..*]) +getName(): String +getAddress(): String +getLibraryItems(): LibraryItem[0..*] +getStudyRooms(): StudyRoom[0..*] +toString(): String

Descriptions:

Library's name
Library's address
Library's assigned librarian
Items held within library inventory
Study rooms located within library
Number of items held within library inventory
Number of study rooms located within library
Maximum number of items held within library inventory
Maximum number of study rooms within library
Library object constructor which takes parameters of library's name, address, assigned librarian, items held within that library, and study rooms located within that library
Sets library's name
Sets library's address
Sets library's items held within inventory
Sets library's study rooms
Returns library's name
Returns library's address
Returns library's items
Returns library's study rooms
Returns a summary of library information

	This class aggregates from Library.																									
<table><tr><th>LibraryItem</th></tr><tr><td>-ISBN: String -title: String -numCopies: int -availableCopies: int -checkoutHoldersID: String[0..*] -dueDate: int[0..*]</td></tr><tr><td>+LibraryItem(ISBN: String, title: String, numCopies: int, availableCopies: int, checkoutholdersID: String[0..*], dueDate: int[0..*]) +setISBN(ISBN: String): void +setTitle(title: String): void +setNumCopies(numCopies: int): void +setAvailableCopies(availableCopies: int): void +setCheckoutHoldersID(checkoutHoldersID: String[0..*]): void +setDueDate(dueDate: int[0..*]): void +getISBN(): String +getTitle(): String +getNumCopies(): int +getAvailableCopies(): int +getCheckoutHoldersID(): String[0..*] +getDueDate(): int[0..*] +toString(): String</td></tr></table>	LibraryItem	-ISBN: String -title: String -numCopies: int -availableCopies: int -checkoutHoldersID: String[0..*] -dueDate: int[0..*]	+LibraryItem(ISBN: String, title: String, numCopies: int, availableCopies: int, checkoutholdersID: String[0..*], dueDate: int[0..*]) +setISBN(ISBN: String): void +setTitle(title: String): void +setNumCopies(numCopies: int): void +setAvailableCopies(availableCopies: int): void +setCheckoutHoldersID(checkoutHoldersID: String[0..*]): void +setDueDate(dueDate: int[0..*]): void +getISBN(): String +getTitle(): String +getNumCopies(): int +getAvailableCopies(): int +getCheckoutHoldersID(): String[0..*] +getDueDate(): int[0..*] +toString(): String	<table><tr><td>Item's ISBN</td></tr><tr><td>Item's title</td></tr><tr><td>Number of coies of item (total in inventory)</td></tr><tr><td>Number of available copies of item (not checked out)</td></tr><tr><td>ID numbers of people who have checked this item out</td></tr><tr><td>Item's due dates (dates upon which checkout holders must return the item to the library)</td></tr><tr><td></td></tr><tr><td>Library item object constructor which takes parameters of item's ISBN, title, number of total copies, number of available copies, ID numbers of people who have checked this item out, and their due dates</td></tr><tr><td></td></tr><tr><td>Sets item's ISBN</td></tr><tr><td>Sets item's title</td></tr><tr><td>Sets item's total number of copies</td></tr><tr><td>Sets item's number of available copies</td></tr><tr><td>Sets ID numbers of people who have checked this item out</td></tr><tr><td>Sets item's due dates (dates upon which checkout holders must return the item to the library)</td></tr><tr><td></td></tr><tr><td>Returns item's ISBN</td></tr><tr><td>Returns item's title</td></tr><tr><td>Returns item's total number of copies</td></tr><tr><td>Returns ID numbers of people who have checked this item out</td></tr><tr><td>Returns item's due dates (dates upon which checkout holders must return the item to the library)</td></tr><tr><td>Returns a summary of the library item's information</td></tr></table>	Item's ISBN	Item's title	Number of coies of item (total in inventory)	Number of available copies of item (not checked out)	ID numbers of people who have checked this item out	Item's due dates (dates upon which checkout holders must return the item to the library)		Library item object constructor which takes parameters of item's ISBN, title, number of total copies, number of available copies, ID numbers of people who have checked this item out, and their due dates		Sets item's ISBN	Sets item's title	Sets item's total number of copies	Sets item's number of available copies	Sets ID numbers of people who have checked this item out	Sets item's due dates (dates upon which checkout holders must return the item to the library)		Returns item's ISBN	Returns item's title	Returns item's total number of copies	Returns ID numbers of people who have checked this item out	Returns item's due dates (dates upon which checkout holders must return the item to the library)	Returns a summary of the library item's information
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<div>Book</div> <div> -author: String -edition: int -publishingYear: int </div> <div> +Book(ISBN: String, title: String, numCopies: int, availableCopies: int, checkoutHoldersID: String[0..*], dueDate: int[0..*], author: String, edition: int, publishingYear: int) +setAuthor(author: String): void +setEdition(edition: int): void +setPublishingYear(publishingYear: int): void +getAuthor(): String +getEdition(): int +getPublishingYear(): int +toString(): String </div>	<div>Book's author</div> <div>Book's edition (example: 1st edition, 2nd edition, etc.)</div> <div>Book's publishing year</div> <div></div> <div>Book object constructor which takes parameters of item's ISBN, title, number of total copies, number of available copies, ID numbers of people who have checked this item out, their due dates, book's author, edition, and publishing year (initial information is passed to the superclass: extends LibraryItem)</div> <div></div> <div>Sets book's author</div> <div>Sets book's edition</div> <div>Sets book's publishing year</div> <div></div> <div>Returns book's author</div> <div>Returns book's edition</div> <div>Returns book's publishing year</div> <div>Returns a summary of book's information</div>
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<div>DiscMedia</div> <div> -type: String -duration: int </div> <div> +DiscMedia(ISBN: String, title: String, numCopies: int, availableCopies: int, checkoutHoldersID: String[0..*], dueDate: int[0..*], type: String, duration: int) +setType(type: String): void +setDuration(duration: int): void +getType(): String +getDuration(): int +toString(): String </div>	<div></div> <div>Disc media's type (CD, DVD, or BluRay)</div> <div>Disc media's duration (in minutes)</div> <div></div> <div>Disc media object constructor which takes parameters of item's ISBN, title, number of total copies, number of available copies, ID numbers of people who have checked this item out, their due dates, disc media's type, and duration (initial information is passed to the superclass: extends LibraryItem)</div> <div></div> <div>Sets disc media's type</div> <div>Sets disc media's duration</div> <div></div> <div>Returns disc media's type</div> <div>Returns disc media's duration</div> <div>Returns a summary of disc media's information</div>
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Librarian	This class aggregates from Library.
-ID: String	Librarian's ID
-name: string	Librarian's name
-email: String	Librarian's email
-phone: int	Librarian's phone number
+Librarian(ID: String, name: String, email: String, phone: int)	Librarian object constructor which takes parameters of the librarian's ID, name, email, and phone number
+setID(ID: String): void	Sets librarian's ID
+setName(name: String): void	Sets librarian's name
+setEmail(email: String): void	Sets librarian's email
+setPhone(phone: int): void	Sets librarian's phone number
+getID(): String	Returns librarian's ID
+getName(): String	Returns librarian's name
+getEmail(): String	Returns librarian's email
+getPhone(): int	Returns librarian's phone number
+toString(): String	Returns a summary of librarian information

StudyRoom	This class aggregates from Library.
-roomNum: int	Study room's number
-size: int	Study room's size (number of participants allowed)
-available: boolean	Study room's availability (available or reserved)
+StudyRoom(roomNum: int, size: int, available: boolean)	Study room object constructor which takes parameters of the room's number, maximum participant size, and availability
+setRoomNum(roomNum: int): void	Sets room's number
+setSize(size: int): void	Sets room's participant size
+setAvailable(available: boolean): void	Sets room's availability
+getRoomNum(): int	Returns room's number
+getSize(): int	Returns room's participant size
+getAvailable(): boolean	Returns room's availability
+toString(): String	Returns a summary of study room information

3) Implementation Class: Methods and purposes

Method: main

Purpose: The main method is used to access a menu for user input and to access other methods based on said user input.

Inputs: optionChosen : int – The relevant number associated with a menu option.

Return: void

Method: menu

Purpose: This method prompts the user with a menu of options from which they can choose to add a library, add a librarian, add library items, add study rooms, search library items, checkout a book, reserve a study room, print library information, or quit the program. Depending on which option is chosen by the user, other methods are called to complete the user's request.

Parameters: none

Return: optionChosen : int – The relevant number associated with a menu option.

Method: createLibrary

Purpose: This method allows the user to create a Library object via various inputs of all needed library information.

Parameters: none

Return: aLibrary : Library – The Library object created and populated from user input.

Method: createLibrarian

Purpose: This method allows the user to create a Librarian object via various inputs of all needed librarian information.

Parameters: none

Return: aLibrarian : Librarian – The Librarian object created and populated from user input.

Method: createLibraryItem

Purpose: This method allows the user to create a LibraryItem object via various inputs of all needed library item information.

Parameters: none

Return: aLibraryItem : LibraryItem – The LibraryItem object created and populated from user input.

Method: createStudyRoom

Purpose: This method allows the user to create a StudyRoom object via various inputs of all needed study room information.

Parameters: none

Return: aStudyRoom : StudyRoom – The StudyRoom object created and populated from user input.

Method: searchLibraryItem

Purpose: This method allows the user to search for a LibraryItem object via various inputs of search terms such as ISBN and title. If a search is specified as being for a book, search terms may also include author, edition, and publishing year. If a search is specified as being for a disc media, search terms may also include media type and duration. Once found, it will print all details of the searched item.

Parameters: none

Return: foundLibraryItem : LibraryItem – The LibraryItem object found based on search criteria.

Method: itemCheckout

Purpose: This method allows the user to checkout a book or disc media. This is done either by direct input of book/disc media details (ISBN, title) or through a search for a LibraryItem to select. The latter is done by calling the searchLibraryItem method. Once an item has been selected, its number of available copies will be decremented, the checkout holder's ID will be placed within its respective array, and the item's due date will be placed within its respective array.

Parameters: none

Return: checkedOutItem : LibraryItem – The LibraryItem object which was checked out.

Method: reserveRoom

Purpose: This method allows the user to reserve a study room. This will be done either by direct input of study room details (room number) or by a search which will display available study rooms to choose from. Once a study room is reserved, its availability will change to reflect that reservation.

Parameters: none

Return: reservedRoom : StudyRoom – The StudyRoom object which was reserved.

Method: printLibraryInfo

Purpose: This method prints a string of library information including name, address, librarian details, total number of books, and total study rooms. The string output will also include a detailed list of library items and study rooms in the library.

Parameters: aLibrary : Library – The Library object created and populated from user input.

Return: void