LIBRARY MANAGEMENT SYSTEM

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09

CURRENT WORK

- ✓ Inheritance
- ✓ Encapsulation
- ✓ Constructors
- ✓ Wrapper class
- ✓ Static keyword
- ✓ Scanner
- ✓ This keyword
- ✓ Method overriding
- ✓ Polymorphism
- ✓ Method overloading
- ✓ Array of objects
- ✓ Try-catch block
- ✓ Exception handling
- ✓ Throw keyword
- ✓ Java inner class
- ✓ Java package

SOFTWARE REQUIREMENTS

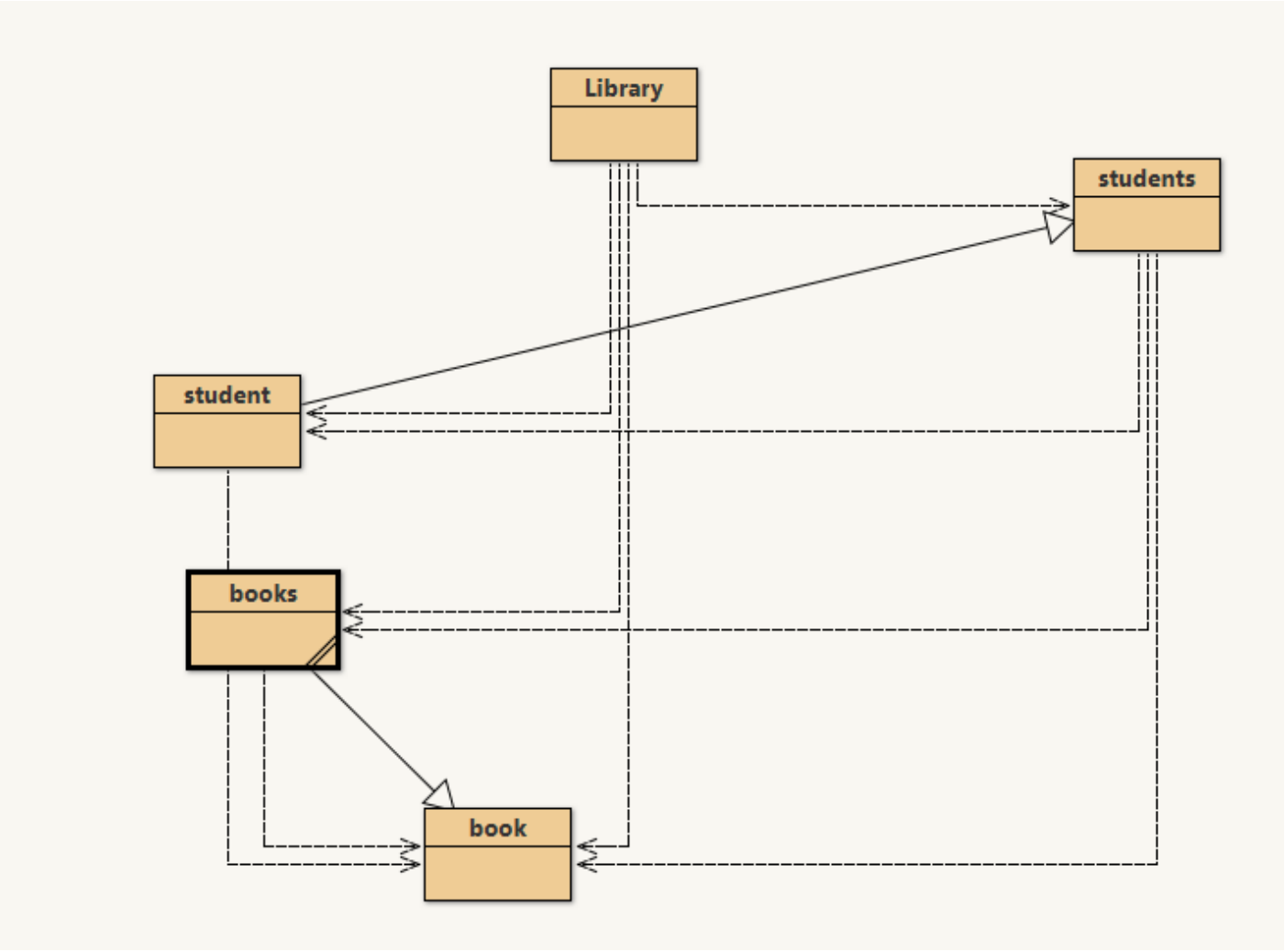
- JAVA 1.8.0_22
- IDE:
    1. IntelliJ
    2. BlueJ

EXECUTIVE SUMMARY

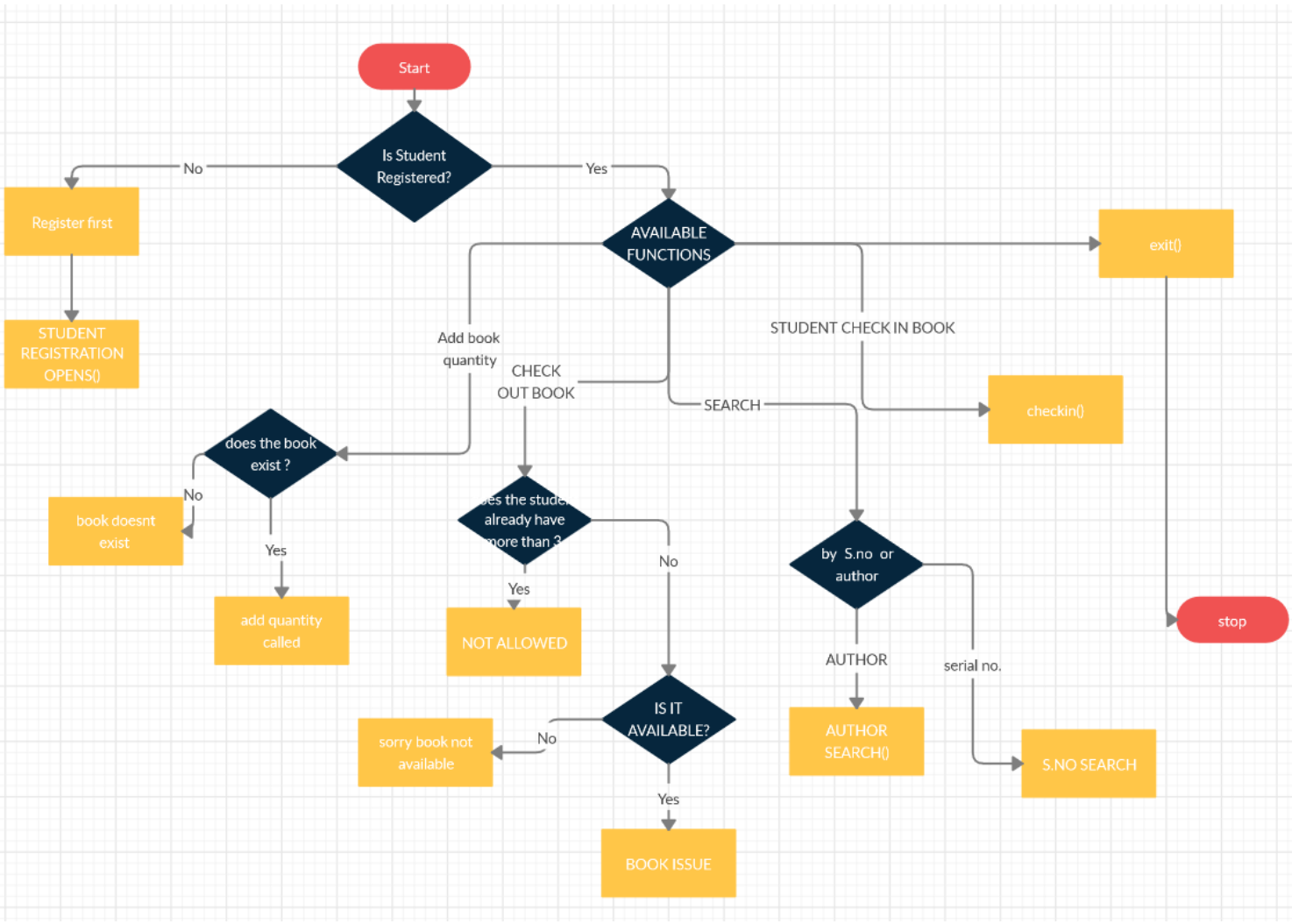
This Library Management system is similar to that of our college's library system and uses almost all basic java functionalities taught in OOPJ lectures and makes a reliable book management system that can easily perform the following functions:

1. Adding a Book to Library.
2. Update Book Quantity.
3. Search a Book with its Serial number.
4. Search Books with Author's Name.
5. Show all Books and their related Information.
6. Registering a Student.
7. Show All Registered Students.
8. Student can Check Out Book from Library (if registered).
    - Student cannot Check Out max than 3 Books
    - You can only borrow a Book If it is Available in Library
9. Student can Check in Book to Library.
10. You can also see the Books which a Student has Checked Out(only while checking in

CLASS FLOWCHART



PIC: BlueJ Class Co-relation flowchart



PIC: ROUGH FLOW DIAGRAM OF ITS WORKING

APPENDIX: CODE

//JAVA MAIN CLASS LIBRARY

```
package library;

import java.util.Scanner;

public class Library {


public static void main(String[] args) {

    Scanner input = new Scanner(System.in);

    System.out.println("********************Welcome to the Student Library!********************");
    System.out.println("              Please Select From The Following Options:                ");
System.out.println("*************************************************************************");
    books ob = new books();
    students obStudent = new students();
    int choice;
    int searchChoice;

    do{

        ob.dispMenu();
        choice = input.nextInt();

        switch(choice){

            case 1:
                book b = new book();
                ob.addBook(b);
                break;

            case 2:
                ob.upgradeBookQty();
                break;

            case 3:
                System.out.println("Enter 1 to Search with Serial No.");
                System.out.println("Enter 2 to Search with Author Name(Full Name).");
                searchChoice = input.nextInt();

                    switch(searchChoice){

                        case 1:
                            ob.searchBySno();
                            break;
                        case 2:
                            ob.searchByAuthorName();

                    }
                    break;

            case 4:
                ob.showAllBooks();
                break;
            case 5:
                student s = new student();
                obStudent.addStudent(s);
                break;
            case 6:
                obStudent.showAllStudents();
                break;
            case 7:
                obStudent.checkOutBook(ob);
                break;
            case 8:
                obStudent.checkInBook(ob);
                break;
            default:
                System.out.println("CHOICE SHOULD BE BETWEEN 0 TO 8.");

        }

    }
    while (choice!=0);
}
}
```

```java
package library;

import java.util.Scanner;

public class students {

Scanner input = new Scanner(System.in);

student theStudents[] = new student[50];

//books book;


public static int count = 0;

public void addStudent(student s){
    for (int i=0; i<count; i++){
        if(s.regNum.equalsIgnoreCase(theStudents[i].regNum)){

            System.out.println("Student of Reg Num " + s.regNum + " is Already Registered.");
            return;
        }
    }
    if (count<=50){

        theStudents[count] = s;
        count++;

    }
}
public void showAllStudents(){

    System.out.println("Student Name\t\tReg Number");
    for (int i=0; i<count; i++){
        System.out.println(theStudents[i].studentName + "\t\t" + theStudents[i].regNum);

    }


}

public int isStudent(){
    //return index number of student if available

     //System.out.println("Enter Student Name:");
    //String studentName = input.nextLine();

    System.out.println("Enter Reg Number:");
    String regNum = input.nextLine();
    try{

    for (int i=0; i<count; i++){

        if (theStudents[i].regNum.equalsIgnoreCase(regNum)){

            return i;

        }

    }
    System.out.println("Student is not Registered.");
    System.out.println("Get Registered First.");


    return -1;

}

catch(Exception e){
    System.out.println("Invalid Entry");
     }
     return -1;
}
public void checkOutBook(books book){
```

```
public void checkOutBook(books book){
    int studentIndex =this.isStudent();

    if (studentIndex!=-1){
        System.out.println("checking out");

        book.showAllBooks();//jjjjjjjjjjj
        book b = book.checkOutBook();
        System.out.println("checking out");
        if (b!= null){

            if (theStudents[studentIndex].booksCount<=3){
                System.out.println("adding book");
                theStudents[studentIndex].borrowedBooks[theStudents[studentIndex].booksCount] = b;
                theStudents[studentIndex].booksCount++;
                return;

            }
            else {

                System.out.println("Student Can not Borrow more than 3 Books.");
                return;

            }
        }
        System.out.println("Book is not Available.");

    }

}

public void checkInBook(books book){

    int studentIndex = this.isStudent();
    if (studentIndex != -1){
        System.out.println("S.No\t\t\tBook Name\t\t\tAuthor Name");
        student s = theStudents[studentIndex];
        for (int i=0; i<s.booksCount; i++){

            System.out.println(s.borrowedBooks[i].sNo+ "\t\t\t" + s.borrowedBooks[i].bookName + "\t\t\t"+
            }
            System.out.println("Enter Serial Number of Book to be Checked In:");
            int sNo = input.nextInt();
            for (int i=0; i<s.booksCount; i++){

                if (sNo == s.borrowedBooks[i].sNo){

                    book.checkInBook(s.borrowedBooks[i]);
                    s.borrowedBooks[i]=null;
                    return;

                }

            }
            System.out.println("Book of Serial No "+sNo+"not Found");

        }


}


}
```

Class compiled - no syntax errors

```java
package library;

import java.util.Scanner;
public class student extends students{

String studentName;
String regNum;

book borrowedBooks[] = new book[3];
public int booksCount = 0;

Scanner input = new Scanner(System.in);

public student(){

    System.out.println("Enter Student Name:");
    this.studentName = input.nextLine();

    System.out.println("Enter Reg Number:");
    this.regNum = input.nextLine();

}
}
```

```java
package library;

import java.util.Scanner;

public class books extends book {

book theBooks[] = new book[50];     // Array that stores 'book' Objects.
public static int count;    // Counter for No of book objects Added in Array.

Scanner input = new Scanner(System.in);



public int compareBookObjects(book b1, book b2){

    if (b1.bookName.equalsIgnoreCase(b2.bookName)){

        System.out.println("Book of this Name Already Exists.");
        return 0;

    }
    if (b1.sNo==b2.sNo){

        System.out.println("Book of this Serial No Already Exists.");
        return 0;
    }
    return 1;
}

public void addBook(book b){

    for (int i=0; i<count; i++){

        if (this.compareBookObjects(b, this.theBooks[i]) == 0)
            return;

    }
    if (count<50){

        theBooks[count] = b;
        count++;

    }
    else{

        System.out.println("No Space to Add More Books.");

    }

}

public void searchBySno(){

    System.out.println("\t\t\t\tSEARCH BY SERIAL NUMBER\n");

    int sNo;
    System.out.println("Enter Serial No of Book:");
    sNo = input.nextInt();

    int flag = 0;
    System.out.println("S.No\t\tName\t\tAuthor\t\tAvailable Qty\t\tTotal Qty");
    for (int i=0; i<count; i++){

        if (sNo == theBooks[i].sNo){

            System.out.println(theBooks[i].sNo + "\t\t" + theBooks[i].bookName + "\t\t" + theBooks[i].authorName + "\t\t" +
                theBooks[i].bookQtyCopy + "\t\t" + theBooks[i].bookQty);
            flag++;
            return;

        }

    }
    if (flag == 0)
        System.out.println("No Book for Serial No " + sNo + " Found.");

}
```

```
public void searchByAuthorName(){

    System.out.println("\t\t\t\tSEARCH BY AUTHOR'S NAME");
    input.nextLine();
    System.out.println("Enter Author Name:");
    String authorName = input.nextLine();
    int flag = 0;
    System.out.println("S.No\t\tName\t\tAuthor\t\tAvailable Qty\t\tTotal Qty");
    for (int i=0; i<count; i++){

        if (authorName.equalsIgnoreCase(theBooks[i].authorName)){

            System.out.println(theBooks[i].sNo + "\t\t" + theBooks[i].bookName + "\t\t" + theBooks[i].authorName + "\t\t" +
                theBooks[i].bookQtyCopy + "\t\t" + theBooks[i].bookQty);
            flag++;
        }

    }
    if (flag == 0)
        System.out.println("No Books of " + authorName + " Found.");

}


public void showAllBooks(){

    System.out.println("\t\t\t\tSHOWING ALL BOOKS\n");
    System.out.println("S.No\t\tName\t\tAuthor\t\tAvailable Qty\t\tTotal Qty");
    for (int i=0; i<count; i++){

        System.out.println(theBooks[i].sNo + "\t\t" + theBooks[i].bookName + "\t\t" + theBooks[i].authorName + "\t\t" +
                theBooks[i].bookQtyCopy + "\t\t" + theBooks[i].bookQty);


    }

}
public void upgradeBookQty(){

    System.out.println("\t\t\t\tUPGRADE QUANTITY OF A BOOK\n");
    System.out.println("Enter Serial No of Book");
    int sNo = input.nextInt();
    for (int i=0; i<count; i++){

        if (sNo == theBooks[i].sNo){

            System.out.println("Enter No of Books to be Added:");
            int addingQty = input.nextInt();
            theBooks[i].bookQty += addingQty;
            theBooks[i].bookQtyCopy += addingQty;
            return;

        }

    }
}


public void dispMenu(){

    System.out.println("-------------------------------------------------------------------------------------------------------------");
    System.out.println("Enter 0 to Exit Application.");
    System.out.println("Enter 1 to Add new Book.");
    System.out.println("Enter 2 to Upgrade Quantity of a Book.");
    System.out.println("Enter 3 to Search a Book.");
    System.out.println("Enter 4 to Show All Books.");
    System.out.println("Enter 5 to Register Student.");
    System.out.println("Enter 6 to Show All Registered Students.");
    System.out.println("Enter 7 to Check Out Book. ");
    System.out.println("Enter 8 to Check In Book");
    System.out.println("------------------------------------------------------------  -------------------------------------------");
}
```

```
public int isAvailable(int sNo){

    //returns the index number if available



    for (int i=0; i<count; i++){

        if (sNo == theBooks[i].sNo){
            if(theBooks[i].bookQtyCopy > 0){

                System.out.println("Book is Available.");
                return i;

            }
            System.out.println("Book is Unavailable");
            return -1;

        }
    }

    System.out.println("No Book of Serial Number " + " Available in Library.");
    return -1;


}

public book checkOutBook(){

    System.out.println("Enter Serial No of Book to be Checked Out.");
    int sNo = input.nextInt();

    int bookIndex =isAvailable(sNo);

    if (bookIndex!=-1){

        //int bookIndex = isAvailable(sNo);
        theBooks[bookIndex].bookQtyCopy--;
```

```
    System.out.println("Enter Serial No of Book to be Checked Out.");
    int sNo = input.nextInt();

    int bookIndex =isAvailable(sNo);

    if (bookIndex!=-1){

        //int bookIndex = isAvailable(sNo);
        theBooks[bookIndex].bookQtyCopy--;

        return theBooks[bookIndex];
    }

    return null;

}

public void checkInBook(book b){

    for (int i=0; i<count; i++){

        if (b.equals(theBooks[i]) ){

            theBooks[i].bookQtyCopy++;
            return;

        }

    }

}
```

```java
package library;

import java.util.Scanner;



public class book {

public int sNo;
public String bookName;
public String authorName;
public int bookQty;
public int bookQtyCopy;

Scanner input = new Scanner(System.in);

public book(){

    System.out.println("Enter Serial No of Book:");
    this.sNo = input.nextInt();
    input.nextLine();
    System.out.println("Enter Book Name:");
    this.bookName = input.nextLine();
    System.out.println("Enter Author Name:");
    this.authorName = input.nextLine();
    System.out.println("Enter Quantity of Books:");
    this.bookQty = input.nextInt();
    bookQtyCopy = this.bookQty;

}

}
```

----------End of all classes under package Library----------

All classes are defined with the easy names and easy to look through the program as a whole, increasing moreover readability of the program

OUTPUT

**********Welcome to the Student Library!**********

Please Select From The Following Options:

"**********

Enter 0 to Exit Application.

Enter 1 to Add new Book.

Enter 2 to Upgrade Quantity of a Book.

Enter 3 to Search a Book.

Enter 4 to Show All Books.

Enter 5 to Register Student.

Enter 6 to Show All Registered Students.

Enter 7 to Check Out Book.

Enter 8 to Check In Book

}

7.Issue book:

Student is not registered

Get registered first

5.Enter Student Name: Vimal Subbiah

Enter reg. no: 189301026

5.Enter Student Name: Random guy

Enter reg. no: 189301025

1.Enter Serial no of book:1

Enter book name: Julius Caesar

Enter authors name: William Shakespeare

Enter quantity of books:4

1.Enter Serial no of book:2

Enter book name: Little Women

Enter authors name: louisa may alcott

Enter quantity of books:3

3.Enter authors name to be searched: William Shakespeare

Found 4 Books

7.Enter book to be checked out:2

Available now:2

7.Enter book to be checked out:2

Available now:1

7.Enter book to be checked out:2

Available now:0

7.Enter book to be checked out: 1

SORRY NO MORE THAN 3 BOOKS CAN BE CHECKED OUT BY A SINGLE PERSON

6.DISPLAY ALL:

VIMAL SUBBIAH 189301026

RANDOM GUY 189301025

3,Enter name of book to be searched: Juluis Caesar

Yes found 3 available

8.Enter reg. no

189301026

Enter books serial no you want to check in.

2

4.BOOKS:

WILLIAM SHAKESPEARE JULUIS CAESAR 3

LOUISA MAY ALCOTT LITTLE WOMEN 4

0.

Bye.

//similarly you can update quantity, add more books, display available books, add users, check out added books

//moreover, you can also check which user has checked out which book.

CONCLUSION AND SCOPE

Rather than designing manually and using time stamps on the back of books and manual toiling to see through the book keeping process, we have made use of a computer as once that data's are stored, it performs accurate book-keeping function

There is no chance of failure or miscalculation if the data provided is correct, use of computers and programming have solved many problems which may be due to human error.

This is not the end but the beginning of the versatile, efficient and outsourcing library management system.

By making this we made a small footstep towards the path of progress of platform independent library management system

Moreover, I would like to thank Ankit Shrivastava sir for teaching and guiding me these topics beforehand to easily implement this project

LIMITATIONS

1. The most significant limitation over this project is its dependency over the server and space because when it fails then whole work is stopped.
2. Response time of the system may vary because of variable network speed.
3. Current project model shows the input and management of limited amount of books, but it can grow over time and more development.
4. Needs a database to further incorporate a large-scale library model for implementation and to display and act upon their data.
5. Future Implementation: more GUI features with a good user interface and a online login and server management with admin and librarian overruled decisions and teachers access to students can be provided too.