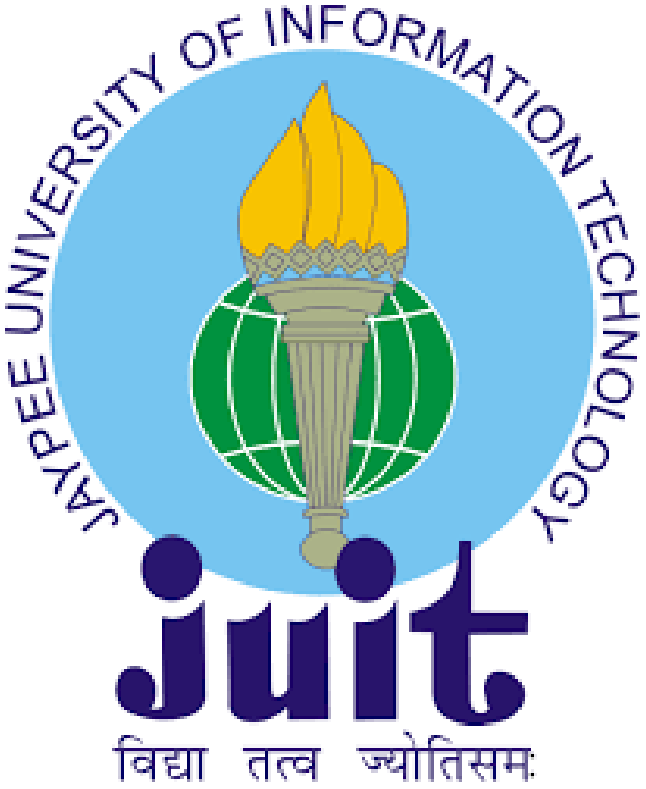

Department of Computer Science and Engineering

PROJECT REPORT

Course Code: **18b17ci473**

Course Name: **Data Simulation Lab**

Library Management System

SIMPY MODULE TO SIMULATE THE JUIT LRC

Submitted by:

ISHITA GUPTA 211472 | **NANDINI SAINI 211355** | 06-05-2023

Submitted to:

Dr. NAVEEN JAGLAN

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Introduction

- The objective of this program is to simulate a library environment where students can request and borrow books. The program aims to provide an interactive experience for users to explore the library system by setting up a virtual library with books, students, and memberships. The program allows the students to request a book from the library and manage the books' availability by recording the borrowing and returning of books. The program provides a real-time simulation of the library's opening and closing hours and keeps track of the students' visits and book requests. Through this program, users can understand the dynamics of a library system and learn about the process of borrowing books from a library.

Problem Statement

- Jaypee University of Information Technology (JUIT) is a premier technical university in India with a vast library that caters to the needs of the students, faculty, and staff. The library has a large collection of books, journals, and research papers, and it is essential to manage them efficiently.

- The current library management system at JUIT is outdated and inefficient. The library staff faces several challenges in managing the books, such as keeping track of the books issued, the due dates, and the fines, etc. The existing system is not automated, which makes it challenging to keep track of the books and manage them efficiently. The lack of automation also makes it difficult to generate reports and statistics required for library management.

- Moreover, the current system does not allow students to reserve a book online or renew the book online, which is a significant inconvenience. This system's inefficiency can lead to confusion and chaos, resulting in students not being able to access the required resources on time.

- Therefore, to overcome these challenges, there is a need to develop a library simulation management system that is automated, efficient, and user-friendly. The proposed system must be capable of managing the library's resources effectively, allowing students to reserve, renew, and return books conveniently. Additionally, the system should also generate reports and statistics required for library management. The proposed system should make the library management process easier, faster, and more accurate.

Aims and Objective

- The objective of this program is to simulate a library environment where students can request and borrow books. The program aims to provide an interactive experience for users to explore the library system by setting up a virtual library with books, students, and memberships. The program allows the students to request a book from the library and manage the books' availability by recording the borrowing and returning of books. The program provides a real-time simulation of the library's opening and closing hours and keeps track of the students' visits and book requests. Through this program, users can understand the dynamics of a library system and learn about the process of borrowing books from a library.

Technology Stack

- Python Programming Language
- Library
    - SimPy
    - YAML
    - Os
    - Random
    - Colorama
    - Date/ Time
    - Itertools
- Classes
- Modules
- Functions

Significance of the Project

- Performance Analysis - With a library simulator we can model and simulate different scenarios and configuration within a library. By analyzing the simulation results, we can gain insights into the library's performance, such as queue lengths, waiting times and resource utilization. This information can be useful in optimizing the library's layout, staffing levels or workflow to improve overall efficiency.

- Service Level Evaluation - A library simulator can help assess the services level provided to library users. By simulating different user arrival patterns and resource availability, you can analyze metrices such as average waiting time, service time and customer satisfaction. This analysis can guide improvements in service quality.

Project Features

- Displays current time
- Displays closing time of the library
- Shows how much time is left
- Displays the entire book list of the library
- And the quantity of each item
- Real-time simulation of the students arriving at library
- Provision for requesting books
- Students can borrow books
- Return the books
- All information is recorded and displayed
- All the information is stored in a separate text file

Code Snippets

Output

```
╔═══════════════════ WELCOME TO Jaypee University of Information Technology, Solan LRC ═══════════════════╗

‖ Library is open until 17:00 ‖ (time left: 15:20:22)

‖ Current time is 01:39:37 ‖


Library Books:

Title                                                                                                  Amount
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Mastering C++                                                                                          1
Let Us C                                                                                               1
Galvin Operating System Concepts                                                                       3
The Fundamentals of Python                                                                             3
Probability and Statistics                                                                             3
Discrete Mathematics                                                                                   3
Introduction to Algorithms                                                                             1
Design and Analysis of Algorithms                                                                      3
Rich Dad Poor Dad by Robert T. Kiyosaki                                                                2
A Primer For The Mathematics Of Financial Engineering                                                  3
The Kite Runner                                                                                        2
The Daily Stoic by Ryan Holiday                                                                        1
Big Magic by Elizabeth Gilbert                                                                         1
Mathematics for Machine Learning                                                                       1
Python Machine Learning By Example                                                                     1
Introduction to Algorithms by Thomas Cormen                                                            3
Introduction to Automata Theory, Languages and Computation by John Hopcroft                            1
Operating System Concepts by Silberschatz, Galvin and Gagne                                            1
Computer Networks by Forouzan                                                                          2
Introduction to Special Relativity by R. Resnick                                                       2
Fundamentals of Optics by D.R. Khanna and H.R. Gulati                                                  3
Introduction to Solid State Physics by Charls Kittel, Wiley, Delhi                                     2
Higher Engineering Mathematics by B.S Grewal                                                           2
Advanced Engineering Mathematics by E.Kreyszig                                                         2
Engineering Mathematics by Babu Ram (Pearson)                                                          1
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Organic Chemistry by Morrison and Boyd                                                                 2
Inorganic Chemistry by J.D Lee                                                                         1
Vector Mechanics by Beer and Johnston                                                                  1
Engineering Mechanics by Merriam and Criage                                                            1
Engineering Mechanics by R.S Khurmi                                                                    1
Textbook of Electrical Technology by B.L Theraja                                                       1
Basic Electrical Technology by Mittel and Mittal                                                       3

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Shambhavi Singh has requested Advanced Engineering Mathematics by E.Kreyszig Book at 2023/05/07 with Gold Membership
Shambhavi Singh has borrowed Advanced Engineering Mathematics by E.Kreyszig Book at 2023/05/07
Prerna Kewat has requested Mindset by Carol Dweck Book at 2023/05/08 with Gold Membership
Prerna Kewat has borrowed Mindset by Carol Dweck Book at 2023/05/08
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Vanshi Goyal has requested A Primer For The Mathematics Of Financial Engineering Book at 2023/05/13 with Gold Membership
Vanshi Goyal has borrowed A Primer For The Mathematics Of Financial Engineering Book at 2023/05/13
Shivam Thakur has requested Introduction to Solid State Physics by Charls Kittel, Wiley, Delhi Book at 2023/05/14 with Gold Membership
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Prerna Kewat gave book back at 2023/05/18 to the library
Aayush Gupta has requested Introduction to Special Relativity by R. Resnick Book at 2023/05/20 with Gold Membership
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Aayush Gupta has borrowed Introduction to Special Relativity by R. Resnick Book at 2023/05/20
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Priyal Maheshwari gave book back at 2023/05/25 to the library
Ishant Thakur has borrowed Introduction to Solid State Physics by Charls Kittel, Wiley, Delhi Book at 2023/05/25
Aayush Gupta gave book back at 2023/05/26 to the library
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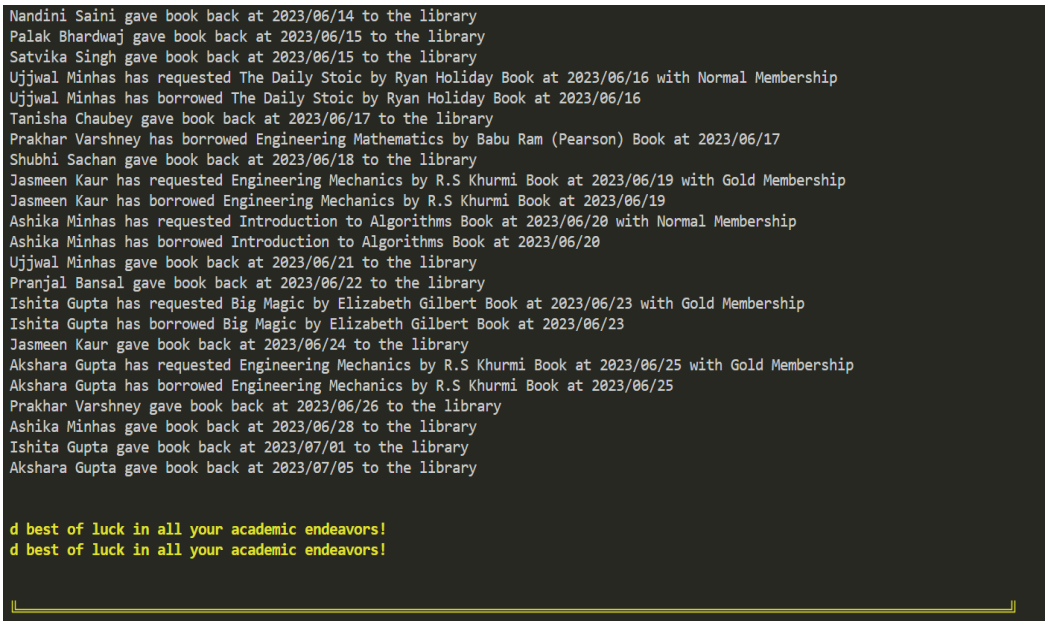

Code Flow and Explanation

1. Importing the necessary modules - Importing modules such as Simpy, os, yaml, random, datetime and, itertools for simulation, date/time operations, functionality, randomization.

2. Loading settings from Settings.yml – It reads information about library, books and students using Pyyaml from Settings.yml.

3. Defining students and book lists – 2 lists are created ‘studentList’ and ‘bookList’ that will hold the simulated students and books.

4. Setting up students – A function is defined where students are randomly paired and assigned a membership option.

5. Setting up the library – A function is defined where it displays the library’s name, opening hours, current time and the available books.

6. Main Simulation – Main function is called to start the simulation. It creates Real time environment , sets up library, student and time. It schedules the arrival and book request. Lastly the simulation run using env.run.

7. Printing closing message – When simulation ends, a library closing message is printed.

8. Program execution –It ensures that the main function is executed when the script is directly run.

GitHub Link to the Project Page

- https://github.com/nandini-2407/Library-Management-System

References

- SimPy Documentation
- Python Documentation