UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Department of Computer Science
Faculty of Computing

Project

(Stack & Queue Implementation)

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Prepared by : 1) MUHAMMAD DANIAL BIN AHMAD SYAHIR (A22EC0206)
2) DANIAL HARRIZ BIN MOHD ASINEH @ MOHD ASNEH (A22EC0152)
3) THEVAN RAJU A/L JEGANATH (A22EC0286)

Section : 02

Group : DTD

Lecturer : Dr. Lizawati Mi Yusuf

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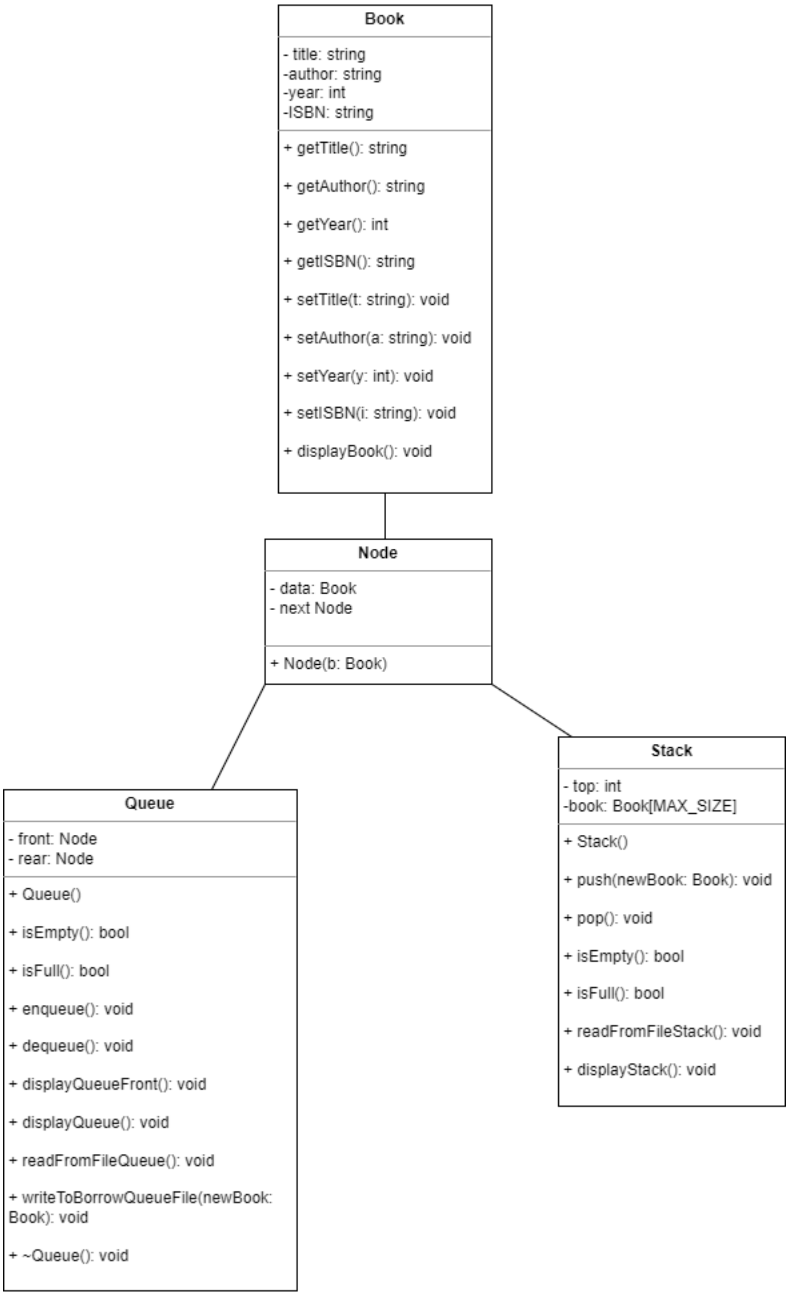
Problem Analysis

DTD Library Management System use for an organized and efficient system to manage books and process borrow requests for a library.The system has two concepts for implementation which is Stack and Queue. Staff using stack concept which allows system to add new books, deleting existing books and displaying current list of books.All are managed using the stack concept.In addition, Staff can receive patron borrow requests,view and process applications using queue concept. Patron interface allows library patrons to request books by entering their name and the title of the book they want to borrow.These requests are kept in a queue.Both interfaces provide a display option that allows users to view current status of books.An iterative user flow allows users to perform multiple actions until they decide to exit the program.In summary, the DTD library management system aims to simplify book management and borrow request processing to ensure the efficiency of library operations by implementing stack and queue concept in data structures to maintain order.

Design

Class Diagram



Pseudocode

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1.  The user is prompted to the main menu of the Library Management System.
2.  The user can choose whether to choose Stack (act as Staff),Queue (act as Patron), or Exit.
3. If the user enters choice 1,the user will be able to act as staff to implement the stack.
        3.1. Staff menu will contain 6 choices which are add a new book,remove book,display the current list (DisplayStack), approve a borrow request or back to the main menu.
        3.2. Users are then prompted to enter a choice based on 6 choices.
        3.3 After entering a choice, users will be redirected to the choice that they choose and follow the instruction following the choice.
        3.4 The book will be updated based on what the user prompted just now.
        3.5 A question will be asked whether the user still wants to continue using the program.
                3.5.1. If the user enters “Y” or “y” the program will return to the main menu.
                3.5.2. If the user enters “N> or “n”,jump to step 5.

4. If the user enter choice 2,user will be able to act as patron to implement queue
        4.1  Patron menu will contain 3 choices which are to request a book (enqueue concept),display current requests (display queue) or back to the main menu.
        4.2 After entering a choice, users will be required to input name and book title for the borrowing process or just to display the current requests of books whether it contains the request or not.
        4.3  A question will be asked whether the user still wants to continue using the program.
                4.3.1.  If the user enters “Y” or “y” the program will return to the main menu.
                4.3.2.  If the user enters “N> or “n”,jump to step 5.

5. If the user enters choice 3,the program will stop
        5.1 A thank you message will be displayed.
6. End
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Data structure concept implementation

Stack Implementation

The “Stack” class is the fundamental component in the Library Management System. It encapsulates the operations that are crucial for the system to be efficient. Both push and pop operations are implemented successfully. Both this operation reflect the core functionality of adding and removing books from the library. The push operations allow the addition of books to the top of the existing list of books, while the pop operation allows the removal of the most recently added book which is the top. Furthermore, the access to the methods inside of the “Stack” class is only limited to the staff members. This will make sure that only authorised personnel will have the ability to modify the list of books in the library.

Queue Implementation

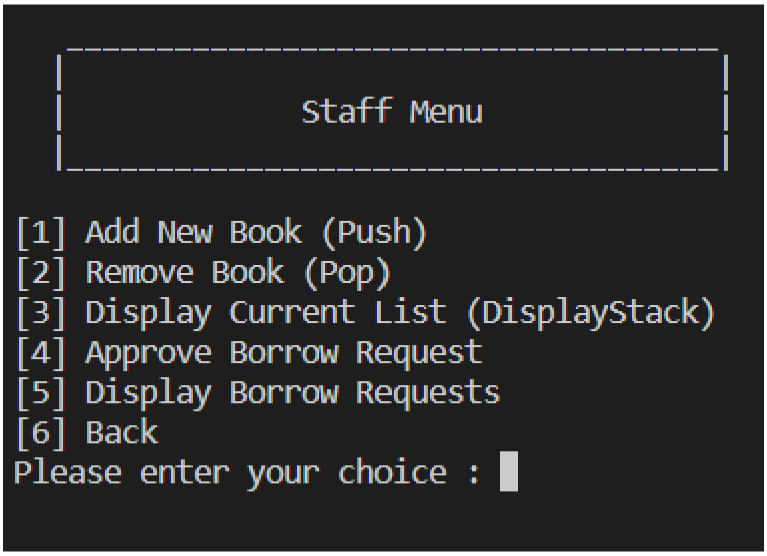
The Queue implementation in the Library Management System uses a linked list structure to manage and facilitate the process of borrowing requests within the library. Instead of fixing the size of the number of requests in the queue by using arrays, a dynamic and flexible linked list is used to handle the requests done by patrons to borrow a book. The linked list is implemented through the ‘Node” class where each node will encapsulate a “Book” object.

The Queue class will maintain the pointers to the front and the rear of the nodes in the linked list. When a patron enqueues or requests for a book that they want to borrow, a new “Node” is dynamically created which contains the relevant book and patron name. If the queue is empty, both the front and rear pointers will be set to this new node. When a different or the same patron enqueues subsequent requests, additional nodes will be sequentially linked to the rear.

The dequeue operation is the removal of the frontal node of the linked list. This operation symbolises the approval of the request at the front of the queue. This operation will adjust the front pointer and deallocate the memory of the removed node.

User Guide

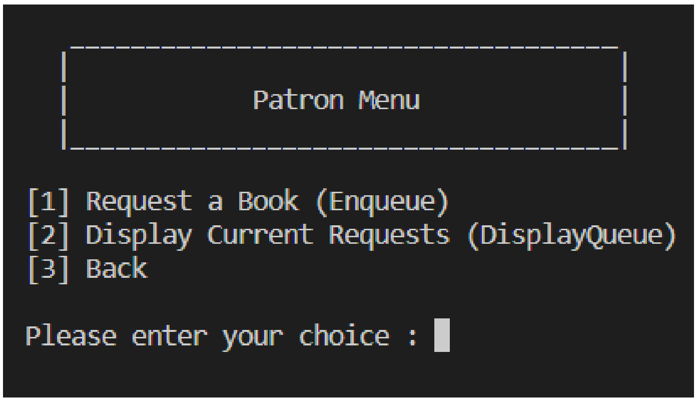
1. Staff Operations
    a. Add New Book (Push) : Staff can add a new book to the top of the list.
    b. Remove Book (Pop) : Staff can remove the book at the top of the list.
    c. Display Current List (DisplayStack) : Staff can display the current list of books.
    d. Approve Borrow Request(DisplayQueuefront and Dequeue) : Staff can approve the front borrow request done by the patrons in the queue and it will dequeue the request from the queue.
    e. Display Borrow Request(DisplayQueue) : Staff can see all the borrow requests in the queue



```
  ____________________________________
 |                                    |
 |             Staff Menu             |
 |____________________________________|

[1] Add New Book (Push)
[2] Remove Book (Pop)
[3] Display Current List (DisplayStack)
[4] Approve Borrow Request
[5] Display Borrow Requests
[6] Back
Please enter your choice :
```

2. Patron Operations
    a. Request a book (Enqueue) : Patrons will make a request to borrow books from the library.
    b. Display Current Requests (DisplayQueue) :   Patrons can display the list of requests.

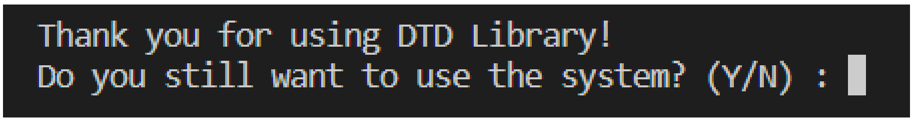


```
  ____________________________________
 |                                    |
 |             Patron Menu            |
 |____________________________________|

[1] Request a Book (Enqueue)
[2] Display Current Requests (DisplayQueue)
[3] Back

Please enter your choice :
```

3. Exiting the System
    a. When the user (staff/patron) chooses option 3, they will exit the system.



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Thank you for using DTD Library!
Do you still want to use the system? (Y/N) :
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