CS 353
Database Systems
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Project Proposal
“LibBerry”

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1. Introduction

In today’s world, digitalization is the key to looking into the future. Using computers and digital systems allows people to execute complicated, crowded, confusing, and hard-to-follow processes due to their capabilities that come with the processors, memories, and other architectural elements. One thing that shines on that issue is the memorial processes that need to be implemented by database systems. Also, it comes to mind that yesterday's bookshelves are today’s databases. Schools are the places that contain eager minds that require and demand information and the best place to explore the information cluster is school libraries. School libraries contain lots of books from different branches of science and art. Furthermore, since these books can be held for some time and then must be returned, there happens to be a need for a tracking system for held and returned books in order to properly circulate the information exchange. Students may use the library's resources to do their homework and it may be a difficult process for both the students and the instructors. Another issue is the feedback of the users to the library. Library executives might need to accumulate these problems/feedback to review and assess their performance and future changes. Hence, it is important to use database systems to create, store and retrieve colossal data that is the result of the mentioned operations. Besides these concerns, since Covid-19 has impacted daily lives all around the world, it is important to develop an online platform that manipulates the data of the library operations such as holding or returning a book, obtaining the homework information, tracking their loans, etc. The solution to these concerns is the development of an online system that helps both users and executives of the library which allows operations of librarians and users of the library easily.

2. Description

In this project, we are going to be implementing an online library database. The name of the project is “LibBerry”. There are 4 different user types in LibBerry: Student, Instructor, Librarian, and Outside Library Members. LibBerry has different functionalities for different users.

LibBerry allows all users to borrow and return materials, see their loans and pay back these loans. Furthermore, instructors can assign homework to a specific section of a specific course, and students that are assigned this homework can see the materials that are going to be used for doing the homework. Librarians are the ones who can change the status of the materials, close the debts of users and send warnings to other users. Users can ask questions, request materials, and reserve private rooms to study with their friends.

Users first send requests to borrow materials and their requests are going to be queued if the requested material(s) is(are) borrowed to someone else. The returning of the materials is going to be executed manually. The burden of changing the state of the material is on librarians. If the user does not return the material on the deadline, they will be charged and the loan will be paid manually again and librarians will close the debts for the users after their payment. Users can require private rooms and if there is an available room, the system will assign the room to the user. Users can access the material sets which are defined already and get more information about their topic more properly. Users can also create reviews for the material that they borrowed, which include a rating (out of ten) and a comment.

There are three main types of materials in the library: printed works, periodicals, and audiovisuals. All materials have a unique id, title, genre, publish date, amount, and location in the library. In addition, printed works have page count, audiovisuals have a rating (from external sources like IMDB, Rotten Tomatoes etc.) and length, and periodicals have page count and period. Instructors can also submit custom materials (e.g. course notes) that belong to one of these three types to the library. Custom materials are not available for students to reserve regularly; they can only be reserved with the use of material sets.

Instructors can assign homework to specific sections of students. They will be asked to include material to be reviewed or used to do the homework as well. Students may see their homework through their account page.

LibBerry is designed to bring main functionalities of a library together with the neoteric library and some of the classroom functionalities.

3. Requirements

3.1. Functional Requirements

3.1.1. All Users

- All users can request new materials.
- All users can reserve private rooms.
- All users can receive warnings.
- All users can borrow or reserve materials.
- All users can access the material sets that they are permitted to see.
- All users can follow materials.
- All users can review materials.

3.1.2. Students

- All students can request books, depending on the book's status, students are added to the waiting list.
- All students can browse for books with individual book title keywords, related books are displayed to the student.
- All students can borrow and return books.
- All students can review a books
- All students can ask their library-related questions to corresponding library personnel.
- All students can filter out their search results with corresponding material types: printed, periodical, audiovisual, custom material.
- All students can filter a single author or authors materials
- Students can see material sets, there exist two types of material sets, public and private. If a student has permission to view the material set, students get view access on the other unpermitted students who cannot view the material set.
- Students can view public material sets.
- Students can view homework which is given by student-related course instructors.
- Students can request unavailable books in the library, depending on the requested amount of the specific book, the library may obtain the specific book.
- All students can follow materials and can view their follow list, also other students can see users follow lists and they can follow them too.
- All students can add filters to their book searches such as pages, author, rating, length, period.

3.1.3. Instructors

- All instructors can make material sets for their courses.
- All instructors can give homework to their students.
- All instructors can search materials, request materials with the same filtering as students.
- All instructors can determine their material sets' privacy status.
- All instructors can change material sets' privacy status.
- All instructors can write reviews for materials and material sets.
- All instructors can see their students in particular courses and sections.
- All instructors can follow the material.
- All instructors can borrow materials from the library system.
- All instructors can return books to the library system.
- All instructors can ask particular library-related questions to the librarian.
- All instructors can request a book.
- All instructors can request an unavailable book for the library to obtain.
- All instructors can upload a specific custom material to the system. This custom material can be a type of printed, periodical, audiovisual or none.

3.1.4. Librarians

- All librarians can lend materials to a user and indicate the action on the system.
- All librarians can accept the returned materials from a user and indicate the action on the system (can change the status of a material).
- All librarians can add or remove users to the system.
- All librarians can add or remove materials to the system.
- All librarians can add or update author profiles in the system.
- All librarians can send warnings to the users with a customizable message.
- All librarians can view the user profiles/accounts.
- All librarians can see new material requests from any user.
- All librarians can reply to the new material request from any user.
- All librarians can see the questions that are asked by any user.
- All librarians can answer the questions that are asked by any user.
- All librarians can close the debts of any user.

- All librarians can accept custom materials from instructors and upload them to the system.

3.1.5. Outside Library Members

- Outside library members are users who are from outside the university (e.g. Ms./PhD. students and academic personnel from other universities).
- All outside library members have a library membership card that allows them to use the library services.
- All outside library members can request to extend the expiration date of their card.
- Outside library members can perform all functionalities described in section 3.1.1 as long as their membership card has not expired.

3.1.6. Other

- The system must calculate and update all users' balances (debt due to late returns).
- The system must allow searching and filtering materials by parameters such as title, publishing date, genre, period (for periodicals), or rating (for audiovisuals).

3.2. Non-functional Requirements

3.2.1. Usability

- Any user on the system should be able to understand the user interface and easily lend a material, ask a question, request a new material, reserve a private study area, see the information of a book, their account information, loan information, and change their password.
- Any user on the system should be able to remember the functionalities and their route on the site after a few visits.
- Any user on the system should be able to easily identify the functionalities of the buttons or text areas.
- Any user on the system should be able to find any information on how to operate on the website for any functionality.

3.2.2. Extensibility

- New forms of materials, users, or features might be added to the library in the future. Therefore, the code must be written in a way that is easily extensible to allow for the addition of these in the project.
- The system's code must use proper object-oriented programming practices to allow for modular code that can easily be extended or substituted.

3.2.3. Maintainability

- Over time, new bugs or performance issues due to the growing number of users and materials may arise. In that case, the code and the database must be maintainable so that necessary changes can be easily implemented without breaking any part of the system or losing data.
- The system should have a proper, easily understandable, well-commented, and documented codebase.
- The database should be designed with maintainability in mind.

3.2.4. Performance

- The system must perform well both in terms of time and storage so that it remains a cheap and usable solution.
- All actions in the system (reserving a book, performing a search, etc.) must respond in at most two seconds.
- Redundancies in the database must be eliminated as much as possible to use the minimum amount of storage.

4. Limitations

There are several limitations to prevent instabilities and preserve the logicality of the library database.

- A user can only reserve one of the same materials at the same time.
- A user can only borrow the material for a certain period. If they fail to give it back in time, their balance decreases.
- Since there are public and private material sets, users can only borrow material sets that they are permitted.
- Users' balances cannot be bigger than 0, they can only be in or not be in debt. Also, only librarians can only change this status.
- A person can only become an outside member if they are a professor or graduate student in another university and have a membership card.
- A user can have only one reservation to the private rooms inside the library at the same time.
- A user can write reviews for the materials that they have borrowed before.
- A user can write reviews for material sets that they have borrowed as a set before.
- A user can only have only one review per material.
- Every course section must have one instructor and a certain number of students assigned.
- Users cannot register through a system, registration is done manually by admins.
- Reservations expire if the reserve user does not show up in the first 15 minutes of the reservation.
- Librarians can fill and reply to a request for new material but they cannot reply to their material request.
- There can only be one reply per material request.
- Instructors can only assign homework to the students in their course sections.
- Materials can be reserved to be borrowed later on when their borrow duration is expired by another user.
- Authors are added to the database with the material assigned to them. If there is a case that their material is removed from the database, they remain on the system for possible future inquiries. Thus, they can be assigned to a material.
- Students can be in only one section of a course in the same semester.

5. Entity-Relationship Diagram

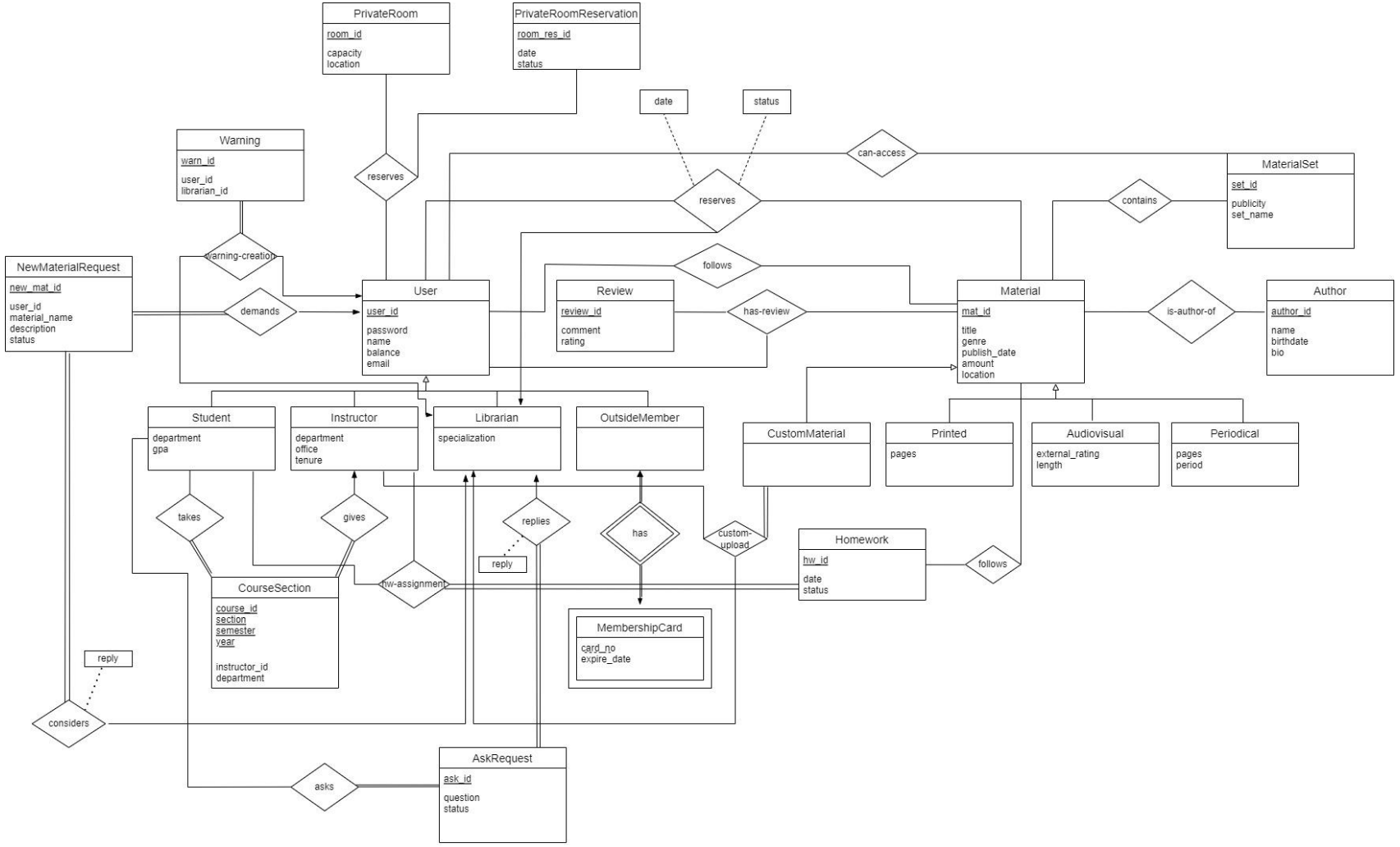

Diagram 1: LibBerry Entity-Relationship Diagram (High-resolution image:https://i.imgur.com/pVmwBuv.jpg)