Bilkent University
CS 353
Project Proposal

Group 26
School Library Database

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1. Introduction

In this report, an application system for a school library database will be described. This report consists of a brief description of the project, the reason and method for the usage of a database, the functional and non-functional requirements of the system, constraints, and a conceptual design diagram using the ER Model.

2. Project Description

An online database will be constructed to satisfy different needs of a university library such as borrowing library items, adding new library items and removing existing ones. The system has three actors. These actors are students and instructors, who are grouped as the users, and librarians. All users have a unique id, name, hashed password, department, status, cell phone number and email saved in the system. Instructors have an additional attribute, which is their office rooms. Students also have an additional attribute indicating whether they are graduates or not. Users will use their password and ID to login to the system. Students, through librarians, can borrow, return or reserve library items and also pay their late return fees for items that they didn't return in time. Meanwhile instructors, who instruct students, can assign library items to students, borrow, return and reserve library items and also pay their late return fees. Finally, the librarians will act as administrators and handle tasks such as registering and removing library items, warning users and charging late return fees. All of these actions are considered as operations with unique IDs and different types for categorization.

Each library item in the system will have a unique ID, title, author or authors, call number, date of publication, year of publication, availability status, language, publisher and description. There are two types of library items, books and journals. Books have edition and print location as extra values while journals have volume and issue. The library items will be listed according to their ID but they can also be listed by their titles or authors as well. Additionally, users can cycle between seeing only available library items or all items registered to the library. Library items will also have genres which they will be grouped according to and users can see the contents of a genre in the system.

3. Why Do We Use a Database?

A school library consists of various kinds of persistent data such as books, journals, records, users, administrators and information on who borrowed which library item or items. This, therefore, creates an organic system with different entities and various relations. As such, all the data, entities and relations are pieces of information that needs to be kept in an orderly fashion. To ensure the persistence of data, access it

efficiently when needed and store it in an orderly fashion, the usage of a database is of paramount importance.

4. How Do We Use a Database?

We use SQL to create, modify and delete tables. In addition, we will use the MySQL DBMS to manage our database. First of all, we need to design our ER diagram to be able to understand the required tables and relations in our database. Then, we create the corresponding database tables in our MySQL database with the necessary SQL statements. Finally, we can modify the database and access required information by sending different SQL statements and queries to our MySQL database.

5. Requirements

5.1. Functional Requirements

- **Assigning a Library Item**
  - Instructors are able to assign library items to students as homework. Assigned library items are saved to the “Assigned Items” section in the student’s account and can be viewed by them later on.

- **Browsing And Viewing A Library Item**
  - Users can browse library items by title, author, genre, or published year from the library items database, along with the combinations of these attributes for better filtering. They can also see whether a library item is available.

- **Hold A Library Item For A User**
  - If a library item is available, users are able to hold it so that they can borrow it later from the library. The system registers the date and sets a 3 days deadline to borrow the library item. A message with the deadline is shown to the user.

- **Adding Users To me-next Hold Queue**
  - If a library item is borrowed or on-hold by another user, users can not hold it, but they can choose the me-next option that adds them to a queue to hold the library item. When a user chooses the me-next option for a library item, the user will be added to a hold queue for that specific library item. When the library item is available to hold, it will be held to the next user in the hold queue and a warning message will be sent to them informing

them that the library item is held for them. If the user does not borrow the library item within a three days period, the library item will be available again for the next user in the hold queue, and so on.

- **Borrowing a Library Item**
  - Users can borrow any library item in the library only if it is not already borrowed or is on-hold to another student. Librarians, though, are responsible for registering the action into the system. Date of borrowing is saved to the system and a deadline to return the library item is set and saved. The borrowed library item is saved to the "Borrowed Items" section in the user's account. The system shows that the library item is currently unavailable.

- **Returning a Library Item**
  - Users can return a library item to the library at any time. Librarians, though, are responsible for registering that action into the system. Date of the return is saved to the system. Library items are saved to the "Returned" section in the user's account. The system shows that the library item is available again, or holds it for the next user in the hold queue, if any.

- **Viewing Warning Messages**
  - Users can view warning messages from librarians on their homepage about the items they should return or will soon have to return. Viewing warning history is also possible.

- **Viewing On-Hold Library Items**
  - Users can view the library items they have on-hold, the date of holding the library item, and the deadline to borrow them before the library item holds are canceled.

- **Viewing Borrowed Library Items**
  - Users can view the library items they have borrowed, the date they have borrowed them, and the deadline to return the library item.

- **Viewing Returned Library Items**
  - Users can view the library items they have returned at any time from their account page.

- **Viewing Assigned Library Items**
  - Students can view library items that their instructors have assigned to them.

- **Registering a New Account**
  - Librarians are able to register new users to the system. Librarians can assign the new account as either student or instructor.

- **Registering a New Library Item and Showing the Library Item**
  - Librarians are able to register new library items to the system at any time. After the new library item is registered, the system automatically shows the new library item in the system and users can view, hold, borrow, etc it.

- **Viewing Users' Accounts**
  - Librarians can view registered users' accounts and their details (on-hold library items, borrowed library items, returned library items, assigned library items and warning messages as well as their dates).

- **Sending Automatic Warning Messages to Return a Library Item**
  - If the user did not return the library item and the due date to return it is approaching, the system sends an automatic warning message to the users two days and one day before the due date and, in case they still did not return the library item, another message when the due date is due is sent. The warning messages are saved to the user's account and they are able to review them.

- **Warning Users**
  - Librarians can send warning messages to users for any reason (e.g. library item-returning date is about to be due or is overdue). The warning messages are saved to the users' accounts and they are able to review them.

- **Fining Late Users**
  - Librarians can fine late users with a certain amount of money if warning messages are sent and users did not respond to them accordingly. Fine with the amount of money and the reason is sent as a text to the user. Warning message with the fine information is sent as well.

- **Automatically Sending Mails With the Warning Messages to Users**
    - Whenever a new warning message arrives to the user's account, a mail is sent to his email address.

- **Automatically Performing Automatic on-hold cancellation**
    - The system cancels the holds on library items if the user does not borrow it in the specified time interval, which is 3 days. The hold moves on to the next person who is on the hold queue, if there is any.

5.2. Non-Functional Requirements

- **Data Retention**
    - The system needs to be able to store considerable information about an entire library's worth of library items, a school's worth of students and their instructors as well as librarians.
    - Data must be stored for as long as needed and discarded immediately after it is no longer needed.

- **Maintainability**
    - System needs to be able to be maintained for a long time with minimal tweaks.
    - An error within the system must be handled without disturbing the essential functionalities of the system or the unafflicted parts of it.
    - System needs to warn all users when data maintenance is to occur to minimize loss of data.
- **Cost**
    - System needs to be cost-efficient to ensure long term usage. Since the structure isn't too complex, factors such as labor, maintenance and life-cycle costs need to be considered. The costs need to be adjusted to keep in mind the small nature of the system and must not exceed a certain amount.

- **Scalability**
    - System needs to be able to scale up and down in parallel to the fluctuating nature of the data. For example, library items can be returned and borrowed at any time without a specified limit on any operation. Additionally, library items can also be added and removed at the librarians' leisure. Finally, the number of users in the system can also change from

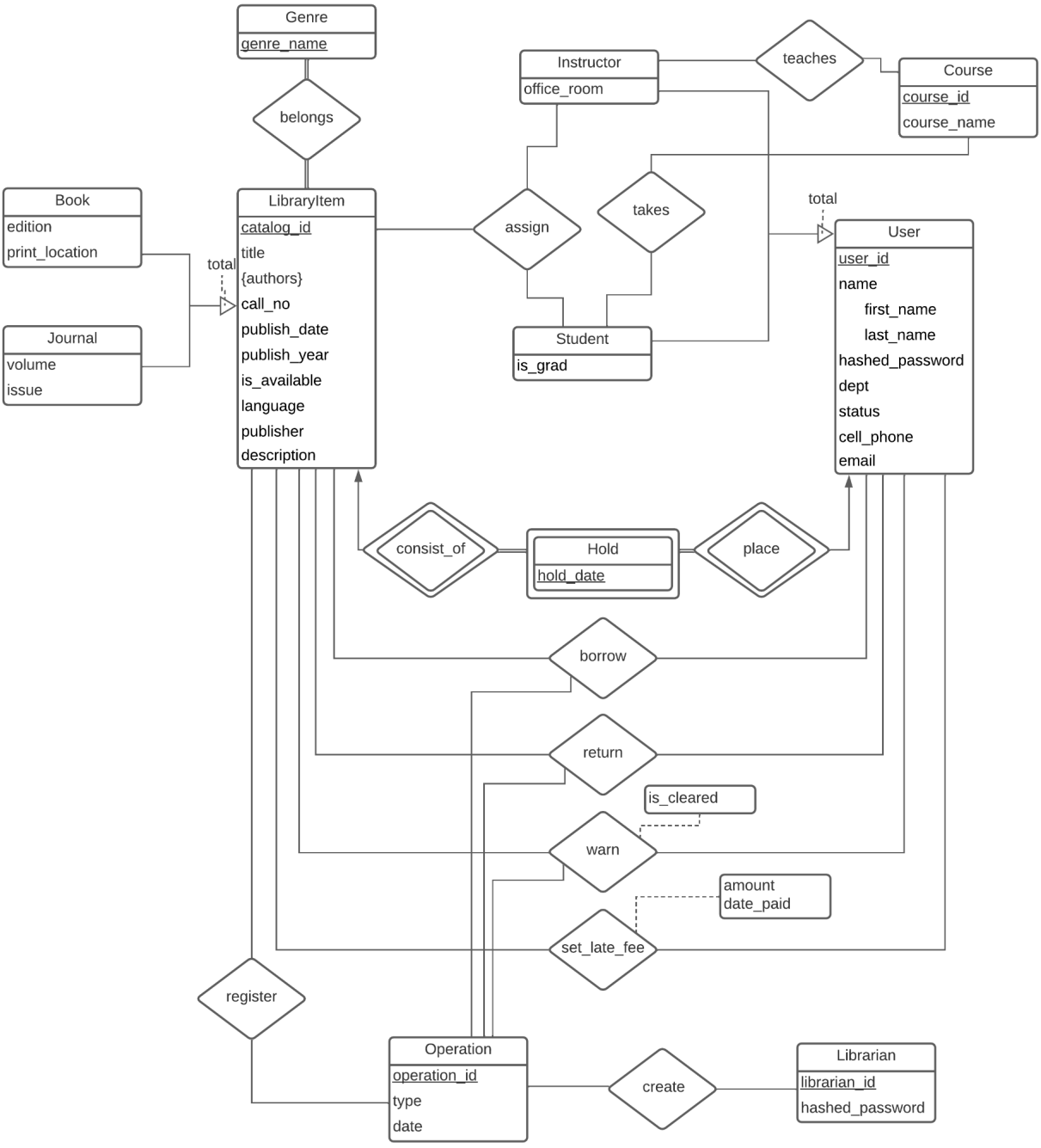
semester to semester. Therefore, the system needs to be able to adapt to all these changes involving data and scale up and down as needed.

- **Performance**
    - System needs to be robust and able to execute designated tasks without delay.
    - Executing tasks in the system needs to be done efficiently to not affect overall performance of users.
    - System needs to be able to perform well even when too many users are online at the same time.

6. Constraints

- Students can borrow and return the library item to the library but they can not register either of these actions to the system. Only librarians can register these actions to the system.
- Only librarians can send warning messages to users.
- Only librarians can fine users.
- Only librarians can register new library items and users to the system.
- Only librarians can view others' accounts; users do not have access to other users' details.
- Only instructors can assign library items as homework to students.
- Instructors can not assign library items to other instructors.
- Users can not hold or borrow an unavailable library item or a library item held by a different student.

7. Conceptual Design Using the ER Model



Note: Librarian actions are done through operations to make actions on the same item at different dates unique. Hold entity set is weak for the same goal. Course entity set exists in order to enable instructors to assign homework to their students for specific courses. Registering is taken as a relationship set to record which books are registered by which librarians.

8. Website

Proposal link: https://kaanozaltan.github.io/Group26.pdf

9. References

[1] A. Silberschatz, H. F. Korth, and S. Sudarshan, *Database system concepts*. New York, NY: McGraw-Hill, 2020.