Digital Object Identifier

Library Database Project

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ABSTRACT The purpose of any database is to help store data in such a way that it can be retrieved efficiently, and users can glean useful information from their database. We have focused on a sample problem featuring a library, which must keep many records like its book catalog, library patrons, customers, employee records, and other related data. We have created a database to record this data, and a user interface to manipulate the database to do certain predefined SQL operations like adding, deleting, and modifying the data

INDEX TERMS Database, Database Management System (DBMS), Library, MTSU, SQL,

I. INTRODUCTION

STARTING out our team was fairly inexperienced with database, and so we looked to research papers to guide us on our path towards our end goal of a functioning library database and user interface. The paper, "Research on University Library Information database under Digital Information Environment" by Liu Lin et al. discussed optimizing the theoretical value of a database by being "people-oriented" and designing aspects of the database to appeal to users like teachers, students, researchers, and librarians. We used some of the findings from this paper to help tune our data to be a better overall system and more user-friendly by keeping an eye out not just for the data, but to the people who need the data.

The paper "Building a Faculty Publications Database: A Case Study" by Sara Tabei et al. Talks about building a faculty publication database. It specifically mentions how the database was built, useful functions, the philosophy behind data collection and populating the database. We used this information to guide where and how we got our data (mostly book data), and how to best go about managing different types of book data.

"Design of Library Data Warehouse Using SnowFlake Scheme Method" discussed the "SnowFlake method" of constructing a database which we used to see how we wanted to construct out database with efficiency and user readability in mind. It also discussed that they were careful to stage all their data before entering it in the database which is something we kept in mind as we collected and stored data.

Once we had a solid foundation of database concepts and ideas we began to create out database application.

II. PROJECT OVERVIEW

We wanted our sample database to reflect a libraries database as closely as possible. To do this we examined what types of items (and thus data) a library keeps track of. A library is truthfully just a fancy rental shop, and so the catalog for a library can include a diverse array of items such as movies, records, books, comics, video games and more. In addition to rented items, a library also needs to keep track of human information records like employee information, library card holders. And then there are intermediary concerns between human elements and rental items, this would be state information regarding library operations. A card holder will borrow a book or a movie, and the library needs to keep track of who has what, when the item is due back, and the condition of the item on loan and when it was returned. There are different ways this data could be handled, but we decided to make a database table per unique item, a book table, a movie table, a record table, comic etc, and a table for each human element, employee, and card holder. Then there would be a table to keep track of the relationship between card holder and rental item, this would be a Rented table which has foreign keys to referencing the renter and which library it was borrowed from. The following will be a short synopsis of tables and some data on table schema:

A. LIBRARY TABLE

This is the table which will hold information pertaining to the library itself, not any of the libraries functions. Accordingly, this means it will record library name, address, libraryID, and the cost of becoming a cardholder. The library ID will be the primary key of this table.

B. BOOKLIST

This is traditionally the most important table for a library database. It will contain relevant information about each book such as the author, publication date, publisher, title, condition, number of copies, what library it is housed in, and its ISBN number. The ISBN number will be the primary key for this table.

C. MOVIELIST

Libraries have become increasingly multimedia, and many have a respectable catalog of movies available to card holders. This table will keep track of a movies title, release date, studio publisher, rating, director. The primary key will be a combination of movie title and release date. In this instance the movie title is not enough as movies are increasingly being rebooted.

D. AUDIOLIST

Continuing with multimedia, libraries often have old records. The size of the library will affect what types of records they keep, it could simply be music records, or larger libraries might have records of comedians, or important speeches, radio shows etc. For our case, we will assume that the library has only musical records to simplify the model of the library we are building. In this instance the table will record, the artist (singer's name), release date, publisher/record label, and song duration. The primary key for this table will be the artist name and the release date. It is more important to uniquely identify music as covers are frequent in the music industry.

E. CARDHOLDER

This table will record information about people registered with the library. It will record their names (First Last and Middle), cardID, the date they signed up, if they any overdue books, fees, address, or if they need to renew their registration.The primary key will be their cardID.

F. EMPLOYEE

This will record information about those who work for the library. It will record name (First Last and Middle), salary, hourlyRate, managerStatus, ssn, and their address. The primary key will be the SSN.

G. ONLOAN

This table is the most important for library management. It will keep track of what is loaned out, be it a book, movie, or record, when it is due back (date), and who it is loaned out to, this will take the form of the cardholders name, and cardholder ID. The primary key will be cardID, and the artificial key transaction number.One person my borrow multiple things so cardID is not enough to uniquely identify a tuple. An artificial key must exist alongside cardID because we must know who is doing the borrowing, and a person may borrow multiple of the same item. By assigning each item borrowed a unique number we can retrieve what a person borrowed by selecting their all transaction numbers associated with a cardID.

H. RETURNED

This is a processing table. Items that have been returned must be processed before returning to library shelves. Items must be assessed for damage, and appropriate fees assigned to the cardholder who damaged them in the case any damage is found. Once a book has been processed it may return to the shelves and be a part of the inventory again.

III. VIEWS

Like many database applications, it is not appropriate for all users to be able to see all the information stored in the database. For library purposes we have 3 types of user views.

A. CARDHOLDER

The base view is the cardholder view. They may see library information (address name), the catalog lists (book movie record) and the list of what they have borrowed, and any fees they have due.

B. EMPLOYEE

One level up from cardholder is the employee. An employee may also be a cardholder, and so an employee has all access a cardholder does. In addition to that, employees may see other cardholders records, the returned list for books to be processed, and other employees names and their work location.

C. MANAGER

Following the same principle, mangers may be cardholders and must be employees, so they have the same access as the others. In our library model there is no authority over a manger, and so as managers they will have full database access.

IV. WHERE WE ARE GOING

A. INSERT ALL THE DATA

The majority of database records have been inserted into the database. We want to have all data fully uploaded in the next week an a half.

B. ADD IN TABLE PROTECTIONS

Our database table definitions are very sparse. There are no checks being done. We want to add in protections for things like salary, values should not be negative, managers should make more than employees and so on.

C. INCREASE FUNCTIONALITY

We want to add some database function and triggers to manage the database and better reflect real library operations. Whenever a return becomes overdue, we'd like to automatically apply a fine to the appropriate cardholder. Whenever an

item is returned we'd like to increment the number of copies available for that item, and similarly if there are no copies available do not allow anyone to borrow that item. By adding these triggers and functions we hope to increase the usability of the database.

D. BUILDING A FRONT END

We are also developing a front end interface so that users can interact with the database. In it's current form it is mainly based on php, and has restrictions on who is allowed to log in (cardholders only at this point).

We want to build out the front end so users can borrow items, return items, and simulate fee payment. We also want to incorporate employee functions like assigning and altering fees, looking up overdue items, changing salaries and other HR functions.

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