ARCHIVES OF BABEL - LIBRARY DATABASE

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Abstract:

The problem being solved is to create a database application that allows both librarians and members to navigate through transactions and book searches. The Archives of Babel is the name of the library the database is being created for. A library database consists of several hundreds to potentially several thousands of books along with DVDs. Searching through a list of books to find out the inventory for a specific book is time costly because the amount of inventories could range anywhere from 1 book to 50,000 books and beyond. Databases brings organization to a library which in turn helps to speed up menial tasks that librarians have to do, such as looking up a book, looking up a loan, finding the location of a book or presenting an organized list of books in the inventories. Time wasted on these tasks is time missed with a member of the library who may have needed help on doing some research, finding a book, or processing a return. Librarians and members will benefit from a library database, the benefits vary for both parties. While a librarian may search through the database to find which members are late on returning their books, members may want to know where "Harry Potter and the Sorcerer's Stone" is located in the library, or if the library even has that book available. Members may also be able to use the database to gauge whether or not the Archives of Babel's books will be of any use to them by searching for a genre. The results will be returned back with the amount of books the genre has. While all of these answers could be found without a database, the answers would take a significant amount of effort and time to obtain. Having a database takes all of these problems away; the database is able to provide answers to specific and complex questions very quickly, which can be very helpful to both librarians and members. The solution being delivered is a database with a GUI (graphical user interface) that can complete these types of searches for the database users, both employees of the library and the members.

The application that will be delivered is one which will be able to be used by librarians and members inside the library, so that less time can be used finding the information, and more time can be spent analyzing the information as the user wishes. For example, if a member walks into the library wondering if the Archives of Babel has a particular book that they have heard about, the first thing the librarian should plan to do is to open up the application created in this project and search for answer using the search functions in the application. Librarians should be able to use Archives of Babel's application, both in the way users do and in more specific ways which relate to transactional library information, such as returns and loans. Librarians will have their own section of the application. This will require authentication in order to gain access, where information about these transactions, member information, and other employee specific information will be able to be accessed. By clicking on this tab, the librarian is able to obtain data members wouldn't be able to receive such as having the GUI display who is the worst offender of returning books and other types of information that members of the library would have no need to access. The application will allow members to access what is important to them while also allowing librarians to access the portions of the database which will help them do their jobs more efficiently.

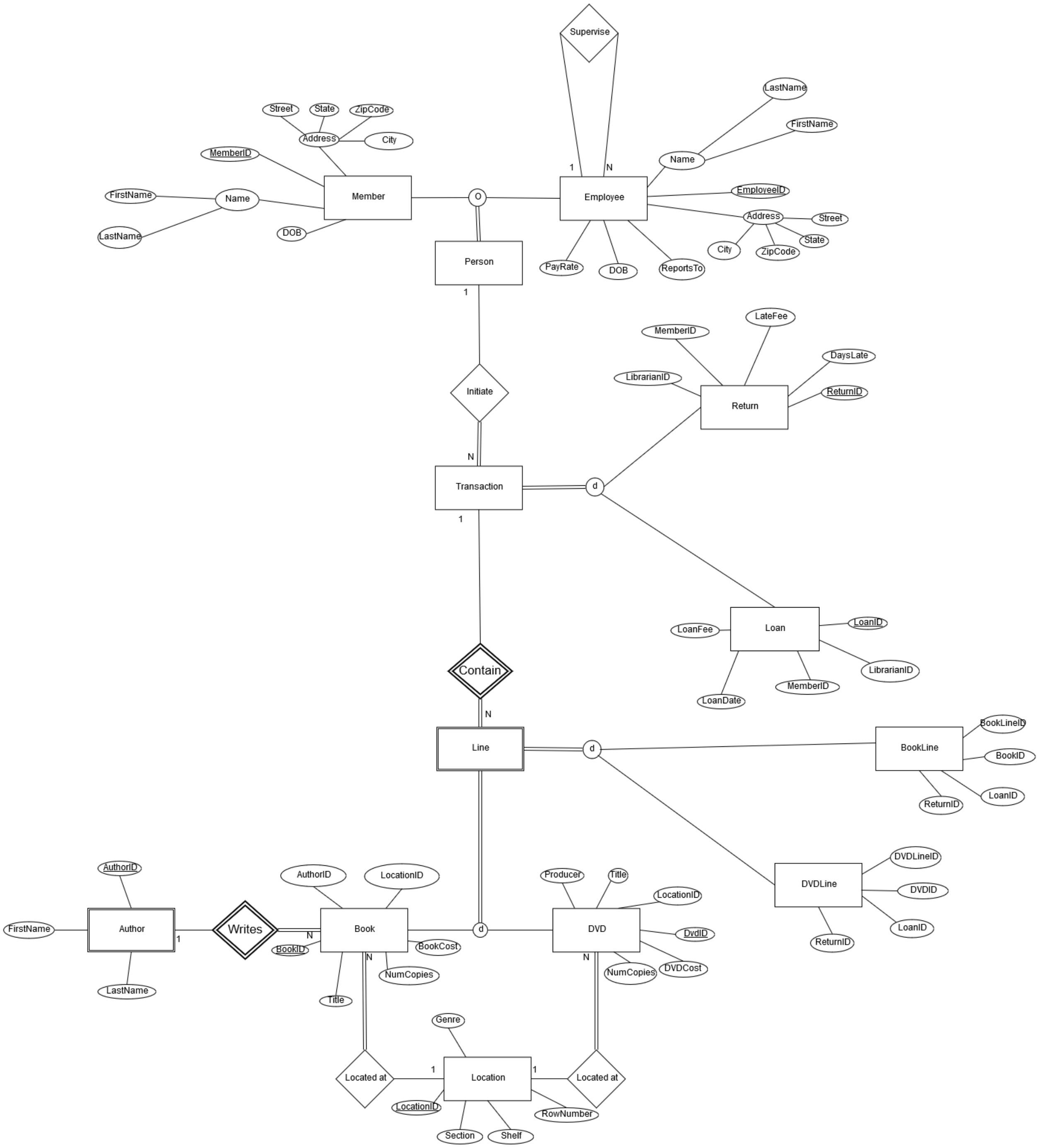
Description:

The entities that are featured in this database is member, employee, return, loan, bookline, DVDLine, DVD, book, author and location. Member and employee is related to each other through the overlapping of person. An employee at the library can also be a member of the library by living in the city where the library exists. When a member decides to initiate a transaction, whether it be a return or a loan, a transaction is initiated by an employee at the same time. However, each transaction can only be a return or a loan as a member is not allowed to return and then borrow the book immediately after. A person can initiate several transactions depending on how many books or DVDs are being loaned/returned.

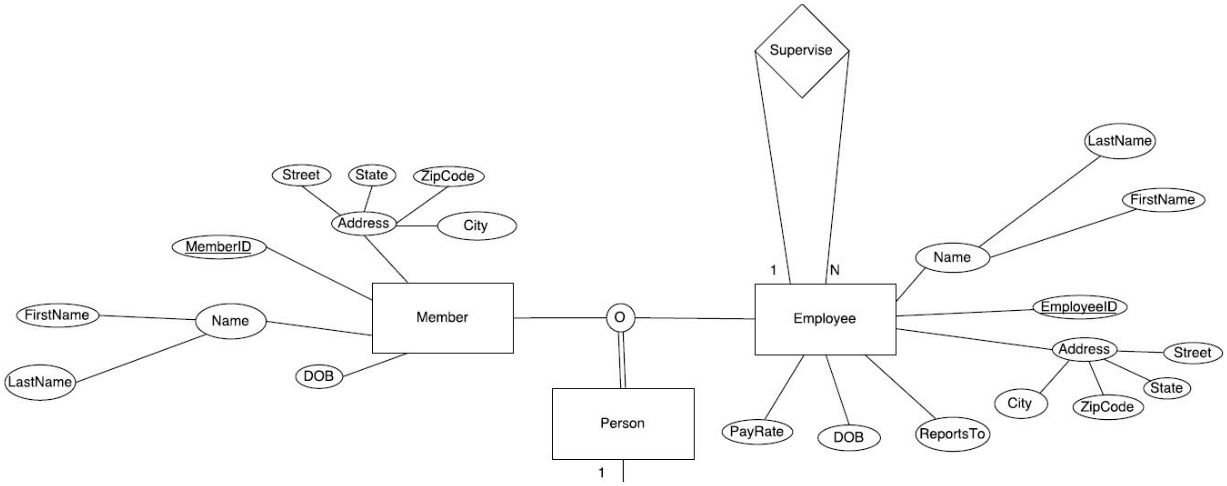
Each transaction contains several lines which can be either a bookline or a DVDLine. The line entity is a weak entity because without the transactions happening, no books or DVDs can be borrowed or returned, which changes the definition of a library. However, each line can only contain a book or a DVD since these are the only materials that are offered by Archives of Babel. Several books and several DVDs have unique locations as two books cannot have the same location id because that would mean the books are stacked upon each other in order to share the same location. Each book is written by author which is a weak entity due to the dependency of the book having to exist in order for there to be a author.

ER Diagrams:

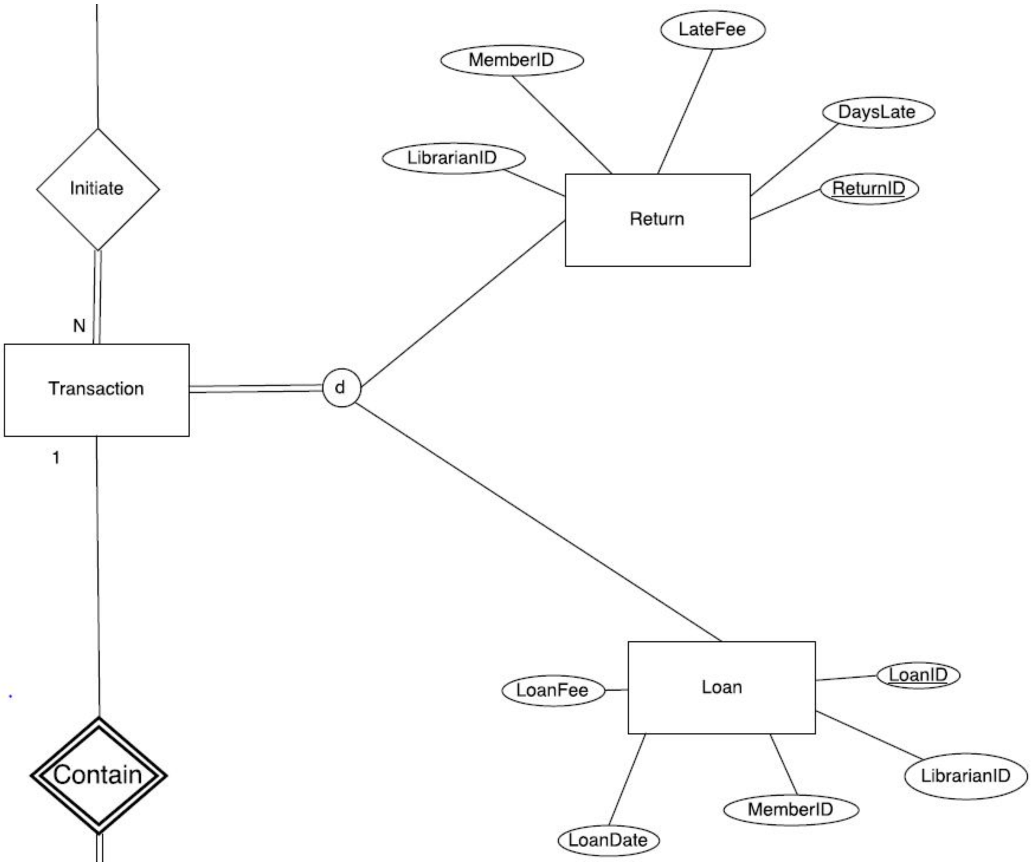
Entire Diagram:



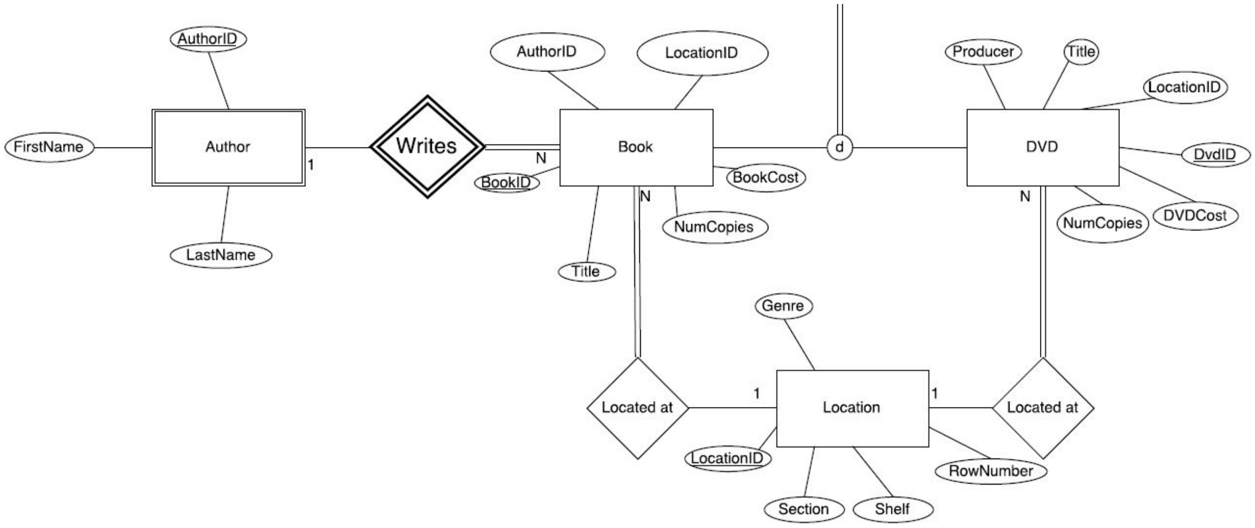
Zoom In on Employee and Member Tables:



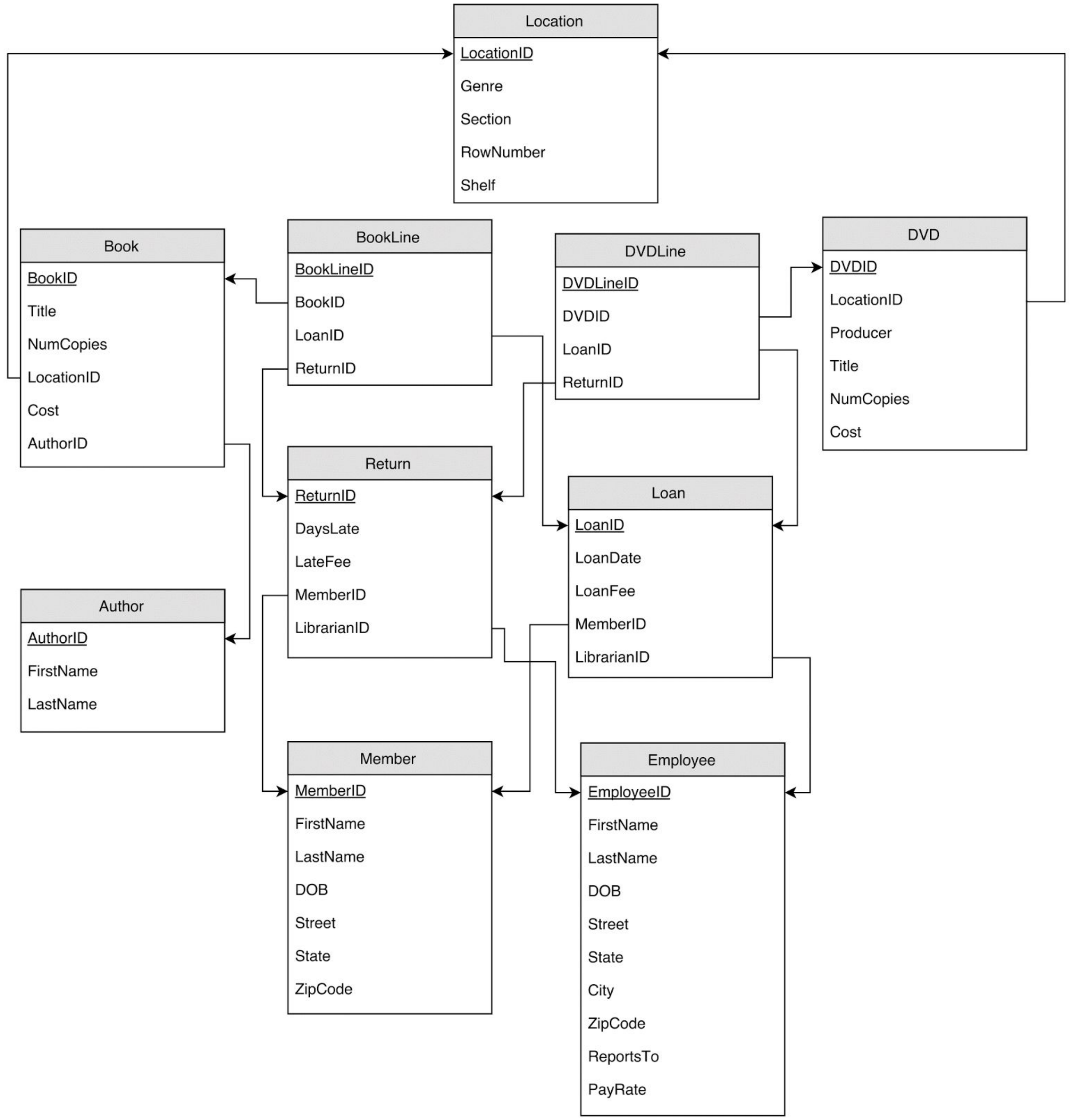
Zoom In on Transaction Related Tables:



Zoom In on the Content of the Library and Where its Located:



Normalized Relations:

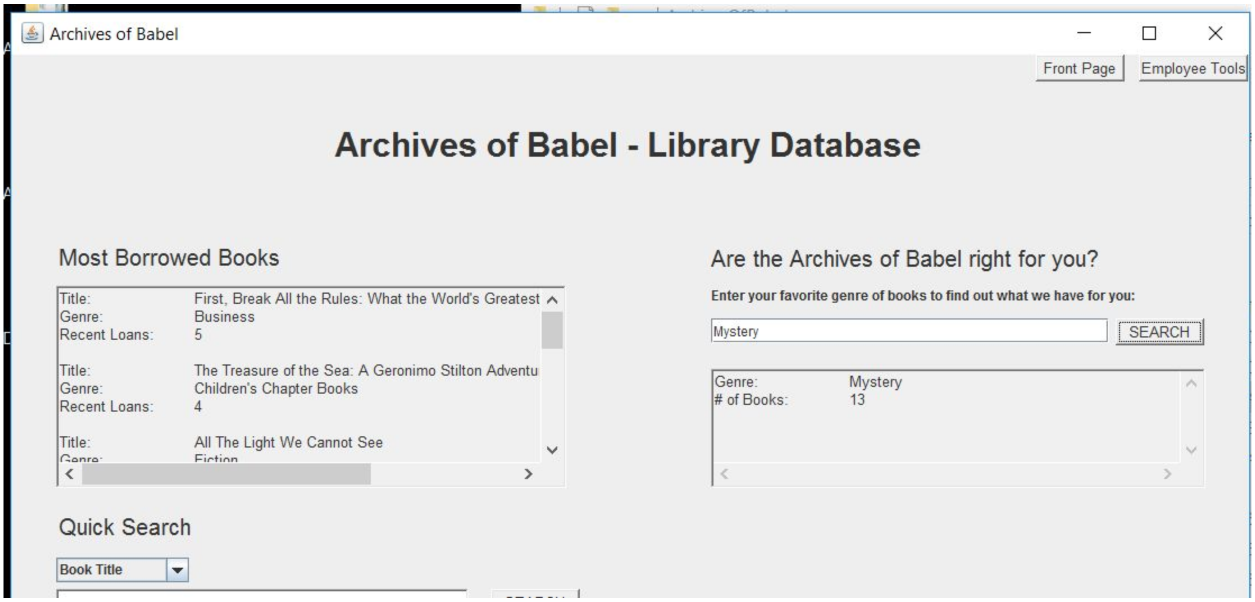


The mapping of the database does not have any multivalued or composite attributes. This means that every row in the database should be unique. None of the attributes in the tables are dependent on the key values that are used for identifying. Once the transitive dependencies were eliminated, the database took the 3NF.

Physical Design:

Indices have not been included in our database because the catalog of books is expected to expand too often for indices to be beneficial. It wouldn't make sense to include indices for the employees either because employees come and go too often too implement an index on that table. It also wouldn't make sense to implement an index in the location table because if a single book was added to the front all of the books that come after it would have to be shifted making the use of an index very difficult to implement.

Sample Screenshots/Reports:



Archives of Babel - Library Database

Most Borrowed Books

```
Title:          First, Break All the Rules: What the World's Greatest
Genre:          Business
Recent Loans:   5

Title:          The Treasure of the Sea: A Geronimo Stilton Adventu
Genre:          Children's Chapter Books
Recent Loans:   4

Title:          All The Light We Cannot See
Genre:          Fiction
```

Are the Archives of Babel right for you?

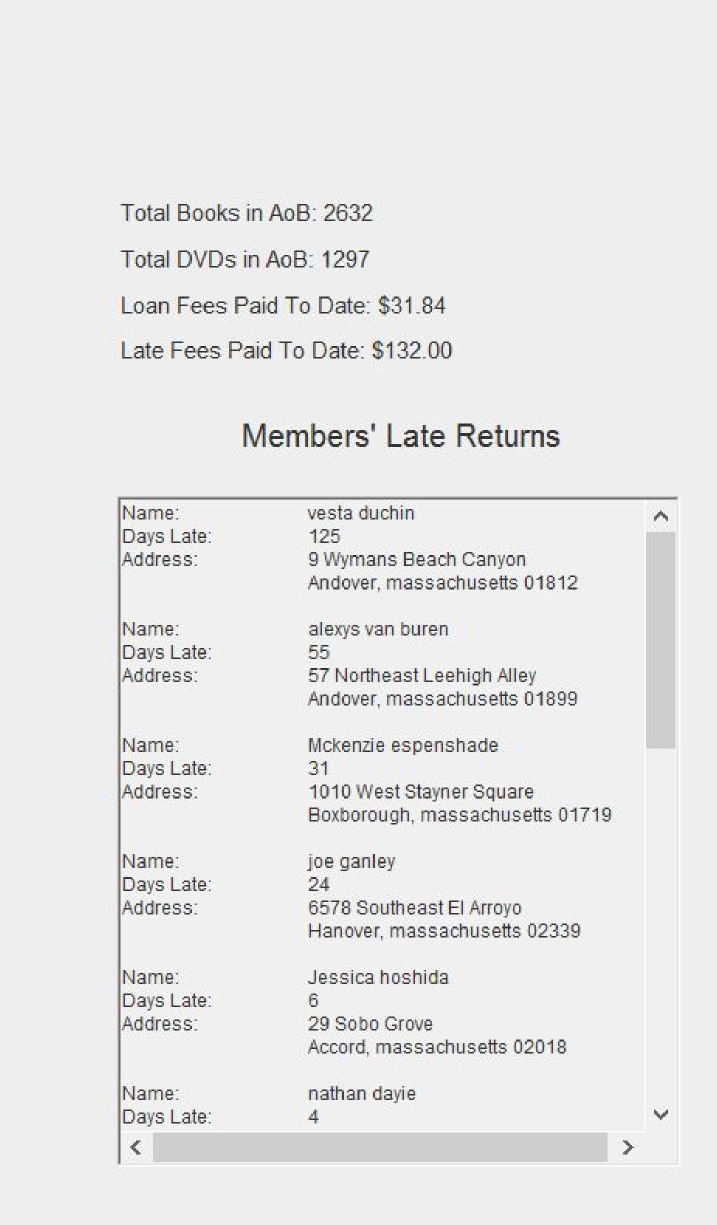
Enter your favorite genre of books to find out what we have for you:

Mystery

```
Genre:          Mystery
# of Books:     13
```

Quick Search

Figure 1 - This screenshot shows the GUI application for the database after performing two separate queries. On the left, there is a query which shows a list of which books have been loaned out the most frequently according to recent data. On the right, there is a search bar which allows users to enter their favorite genre of books and query the database to see how many books AoB has of that genre. Both of these queries demonstrate examples of why a member of the library would benefit from the database. The database is able to give quick answers to complex questions. In this case, the database allows users to get a feel for what the library is about, and decide whether or not AoB is for them.



Total Books in AoB: 2632

Total DVDs in AoB: 1297

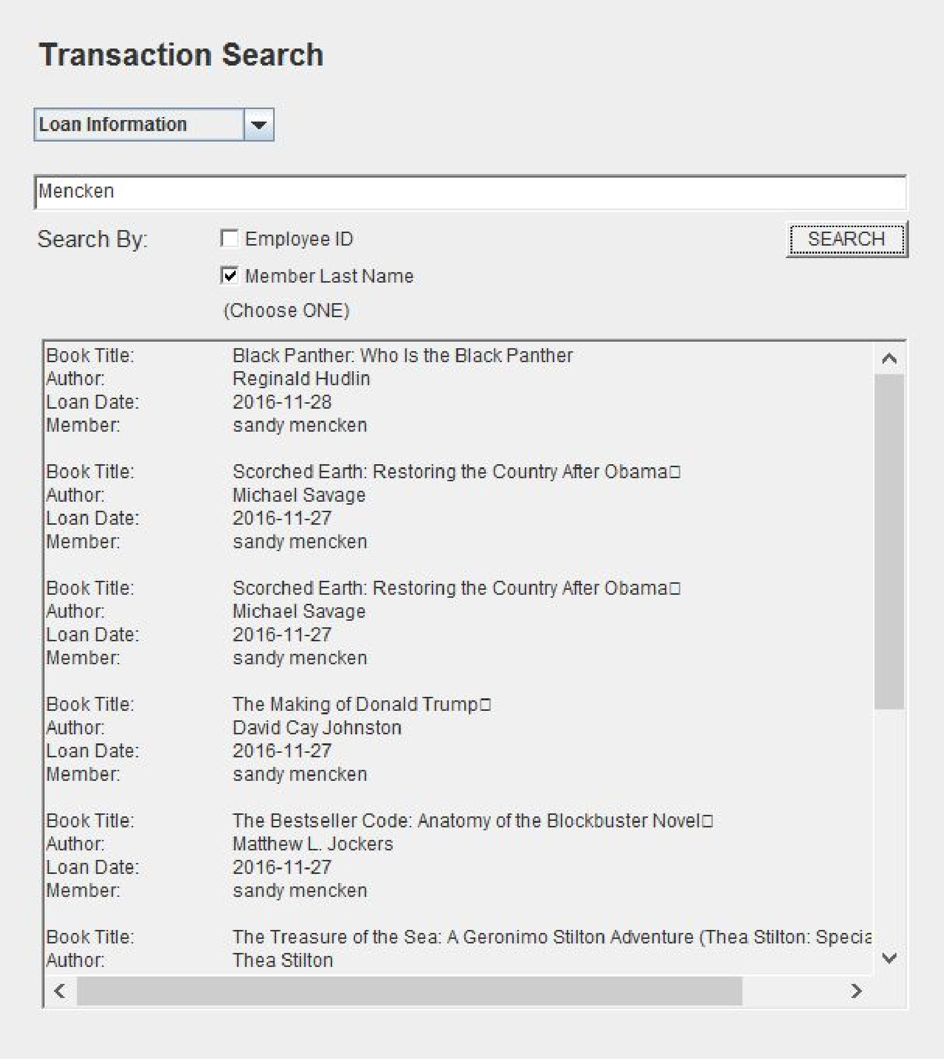
Loan Fees Paid To Date: $31.84

Late Fees Paid To Date: $132.00

Members' Late Returns

```
Name:          vesta duchin
Days Late:     125
Address:       9 Wymans Beach Canyon
               Andover, massachusetts 01812

Name:          alexys van buren
Days Late:     55
Address:       57 Northeast Leehigh Alley
               Andover, massachusetts 01899

Name:          Mckenzie espenshade
Days Late:     31
Address:       1010 West Stayner Square
               Boxborough, massachusetts 01719

Name:          joe ganley
Days Late:     24
Address:       6578 Southeast El Arroyo
               Hanover, massachusetts 02339

Name:          Jessica hoshida
Days Late:     6
Address:       29 Sobo Grove
               Accord, massachusetts 02018

Name:          nathan dayie
Days Late:     4
```

Figure 2 - This is an example of 5 of the queries which are run on the Employee Toolkit page of the AoB Application. The queries on top show the employee basic information about the status of library, such as how many books and DVDs are in the library and how much has been paid in fees by members. The results box below Member's Late Returns displays which members have frequently returned books late. This gives the employee information about how many days returns have been late for each member, as well as their address so that a reminder letter can be sent to them to return their late books, if necessary. This is one example of how the database can be useful to employees as well.



Transaction Search

Loan Information ▾

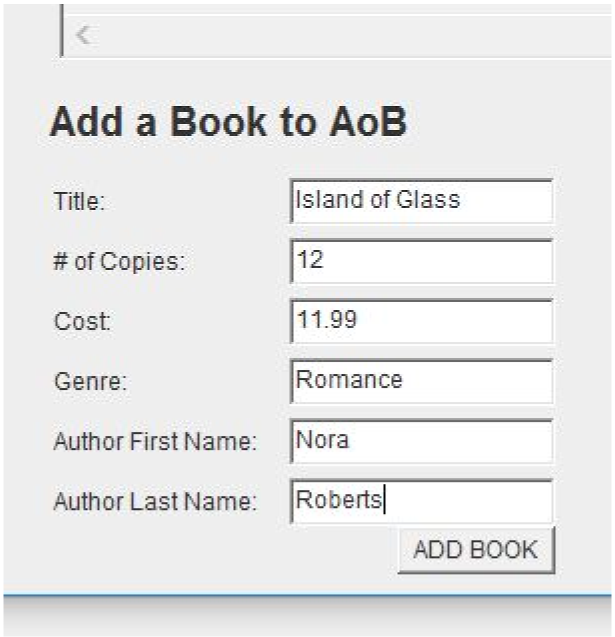
Mencken

Search By: ☐ Employee ID
☑ Member Last Name
(Choose ONE)

SEARCH

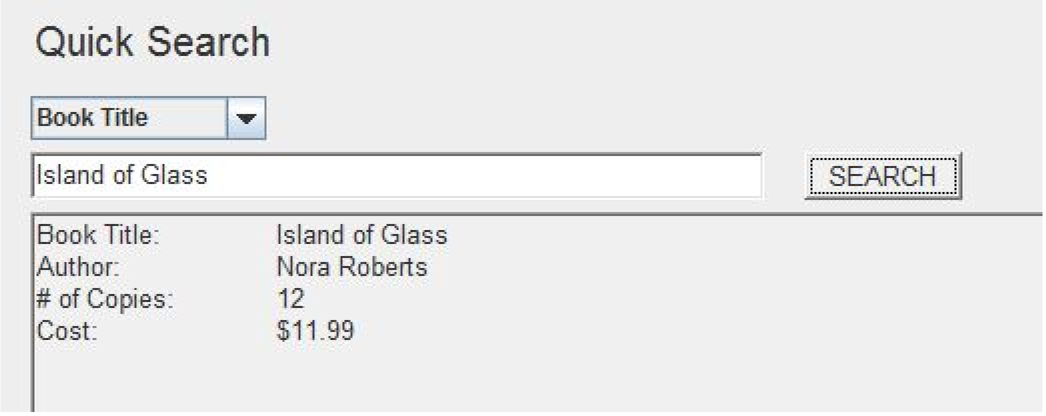
```
Book Title:        Black Panther: Who Is the Black Panther
Author:            Reginald Hudlin
Loan Date:         2016-11-28
Member:            sandy mencken

Book Title:        Scorched Earth: Restoring the Country After Obama□
Author:            Michael Savage
Loan Date:         2016-11-27
Member:            sandy mencken

Book Title:        Scorched Earth: Restoring the Country After Obama□
Author:            Michael Savage
Loan Date:         2016-11-27
Member:            sandy mencken

Book Title:        The Making of Donald Trump□
Author:            David Cay Johnston
Loan Date:         2016-11-27
Member:            sandy mencken

Book Title:        The Bestseller Code: Anatomy of the Blockbuster Novel□
Author:            Matthew L. Jockers
Loan Date:         2016-11-27
Member:            sandy mencken

Book Title:        The Treasure of the Sea: A Geronimo Stilton Adventure (Thea Stilton: Specia
Author:            Thea Stilton
```

Figure 3 - This is an example of a search that an employee might want to do while carrying out their everyday tasks. The employee has chosen to search for "Loan Information" by a member's last name. The result in the text box below shows all of the loans which that specific member has completed. This query is useful for employees simply for looking up past transactions in case the librarians need some more information about the transaction, or if a member requests more information about a particular loan or return.



Add a Book to AoB

Title: Island of Glass
# of Copies: 12
Cost: 11.99
Genre: Romance
Author First Name: Nora
Author Last Name: Roberts



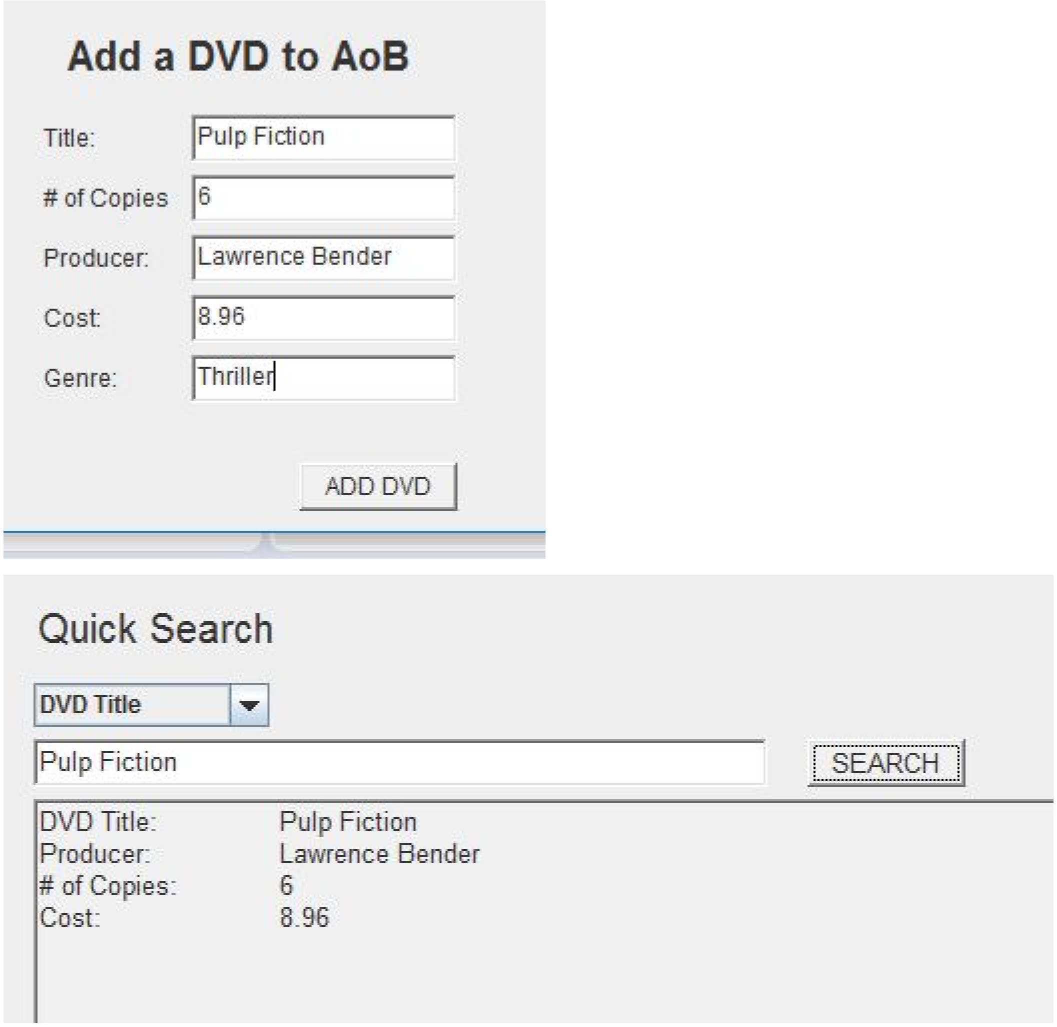
Quick Search

Book Title

Island of Glass

```
Book Title:       Island of Glass
Author:           Nora Roberts
# of Copies:      12
Cost:             $11.99
```

Figure 4 - The two pictures above show the ability to add a new book to the database. In the first picture, the user inputs all of the data about the book and presses "ADD BOOK". Then, as shown in the second picture, a search can be done to locate the book in the database, proving that the book has been added successfully. This is useful for employees who will need to add books to the database when new books are brought to the library. The second picture also shows off the ability to search for books by title. This is useful for members which allows members to come into the library, search for a book of their desire, and immediately determine whether or not the library has the book.



Add a DVD to AoB

Title: Pulp Fiction

# of Copies 6

Producer: Lawrence Bender

Cost: 8.96

Genre: Thriller

Quick Search

DVD Title

Pulp Fiction

DVD Title:	Pulp Fiction
Producer:	Lawrence Bender
# of Copies:	6
Cost:	8.96

Figure 5 - The two pictures above show the ability to add a new DVD to the database. In the first picture, the user inputs all of the data about the DVD and presses "ADD DVD". Then, as shown in the second picture, a search can be done to locate the DVD in the database, proving that the DVD has been added successfully. This is useful for employees who will need to add DVDs to the database when new DVDs are brought to the library. The second picture also shows off the ability to search for DVDs by title. This is useful for members which allows members to come into the library, search for a DVD of their desire, and immediately determine whether or not the library has the DVD. This ability to add and search for DVDs is similar to the function of adding in books and searching.

<u>Source code & structure:</u>

Data dumps (DDL), structural database code (DML), and source code for the GUI (AoBApplication) have been included in separate files located in zip file.

User Manual (Application Setup):

Enter the directory on the system being used which contains the Executable JAR file submitted with the project and enter the following command:

```
java -jar AoBApplication.jar <path to database file>
```

Be sure to add the users system's absolute path to the database file at the end of the command to ensure that the program can properly connect to the AoB Database. If done correctly, the front page of the application should appear.

Project Unfolding:

The hardest part of this project was creating the GUI and writing the queries. Writing the queries was probably the most disliked piece for our group because queries for a library is usually simple. Most members would search for things like books written by J.K. Rowling or books that have a genre of fictional fantasy. The easiest thing about this database was finding the data because of the large amounts of libraries which makes it easy to collect. The employee and members had to be made up which was easy by using generators to create names and addresses. By doing a large-scaled project, this has taught us about time management and planning. Since there were three of us in the group, this helped with making the database like one person finds at least three entities of data. This helps to decrease the amount of work for everybody. Along with that, planning what each person would do weekly helps to decrease the stress of rushing things and helps to make sure there is some free time for us to double check and make any changes necessary to the packet or presentation.

Conclusion Statement:

The final product is an application that any library would be able to use in order to keep track of their books, DVDs, locational information, transactional information, employee information, and member information. The application would be optimal for use inside any library for members and employees alike. Employees and members could each use the graphical-user-interface to query the back-end of the database in different ways. For example, employees can search for transactional information, add new books to the library's database, or see which members have been late with their returns. On the other hand, users are able to quickly search to see if the library is able to suit their needs. If members find that the library fits their needs, members can search the database for their desired books or DVDs by either title, author, or producer. The database application is not perfect, however. For example, the GUI application cuts off all of the graphical text labels when run on UNIX based systems, even though the application works without any issues on Windows systems. Going forward, this would need to be corrected in order to make the application useable for a broader spectrum of clients. In addition to this, there is no way of adding new transactional information from the GUI. These are just some of the features which could be added to the application, leaving plenty of room for improvement to an already fully functional product.