Team ORCHID

Library Database Project
Logical Relational Modeling

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Introduction

This document outlines and documents the logical relational model for the project.

Project Overview

The Library Database Project aims to simplify data management and improve daily operations for a single library. This system helps librarians easily track inventory, manage user accounts, keep records of borrowed items, and create useful reports. Library staff and visitors will have appropriate access based on their roles, ensuring easy and organized interactions with the library's resources.

Scope

This database is designed for a single library, handling its catalog, user accounts and item loans, and Item reservation. It is not intended for multi-branch systems but provides essential features to support daily operations. The system enables structured and accessible interactions for all users, from staff to guests.

Relational Schema Mapping

This section describes each entity and their associated attributes, keys, and functional dependencies. For more detailed descriptions of each relation and entity, refer to the conceptual modeling document.

This information can also be seen in table format in the data dictionary.

Account

The *account* relation is the equivalent of the Account entity.

Account Attributes
Account ID.

- Primary key.
- *Name in Database:* account_id
- *Data Type:* Integer
- *Domain:* Real, positive numbers. Cannot be NULL.
- *Default:* Minimum number that is not already identifying another record.

Account Type.

- Foreign key associated to an *account type* tuple.

- *Name in Database:* account_type_id
- *Data Type:* Integer.
- *Domain:* Value must exist in a tuple belonging to the account relation. Cannot be NULL.
- *Default:* The ID of the Account Type with Adult as its name.

First Name.

- *Name in Database:* first_name
- *Data Type:* String.
- *Domain:* String less than 35 characters. Cannot be NULL.
- *Default:* None.

Last Name.

- *Name in Database:* last_name
- *Data Type:* String.
- *Domain:* String less than 35 characters. Cannot be NULL.
- *Default:* None.

Middle Initial.

- *Name in Database:* middle_initial
- *Data Type:* Character.
- *Domain:* Single character.
- *Default:* None.

Account Status.

- *Name in Database:* restricted
- *Data Type:* Boolean.
- *Domain:* True or False. Cannot be NULL.
- *Default:* False.

Address.

- *Name in Database:* address
- *Data Type:* String.
- *Domain:* String less than 50 characters.
- *Default:* None.

Date of Birth.

- *Name in Database:* birthdate
- *Data Type:* Date.
- *Domain:* Formatted as YYYY-MM-DD. Cannot be a future value. Cannot be NULL.
- *Default:* None

Email.

- *Name in Database:* email
- *Data Type:* String.
- *Domain:* String less than 62 characters. Must end with a valid domain name. Cannot be NULL.
- *Default*: None.

Phone Number.

- *Name in Database:* phone_number
- *Data Type:* String.
- *Domain:* String that is 10 characters in length, all integers.
- *Default:* None.

Parent ID.

- Foreign key associated to another account_id within the account relation.
- *Name in Database:* parent_id
- *Data Type:* Integer.
- *Domain:* Value must exist in a tuple belonging to the account relation. The type of the tuple cannot be Student.
- *Default:* NULL.

Account Functional Dependencies

The functional dependencies will be added at a later date.

Account Type

The *account type* relation stores each valid account type.

Account Type Attributes

Account Type ID.

- Primary key.
- *Name in Database:* account_type_id
- *Data Type:* Integer.

- *Domain:* Real, positive numbers. Cannot be null.
- *Default:* Minimum number that is not already identifying another record.

Type Name.

- *Name in Database:* account_type_name
- *Data Type:* String.
- *Domain:* String that is 10 or less characters in length.
- *Default:* Adult.

Account Type Functional Dependencies

The functional dependencies will be added at a later date.

Contributor

Contributor entities contain information about a contributor to a work. This includes authors, music artists, and film directors among others.

Contributor Attributes

Contributor ID.

- Primary key.
- *Name in Database:* contributor_id
- *Data Type:* Integer.
- *Domain:* Real, positive numbers. Cannot be NULL.
- *Default:* Minimum number that is not already identifying another record.

First Name.

- *Name in Database:* first_name
- *Data Type:* String.
- *Domain:* String less than 35 characters. Cannot be NULL.
- *Default:* None.

Last Name.

- *Name in Database:* last_name
- *Data Type:* String.
- *Domain:* String less than 35 characters. Cannot be NULL.
- *Default:* None.

Middle Initial.

- *Name in Database:* middle_initial
- *Data Type:* Character.
- *Domain:* Single character.
- *Default:* None.

Contribution

Contribution represents the relationship between contributors and items.

Contribution Attributes

Contribution ID.

- Primary key.
- Name in database: contribution_id
- *Data Type:* Integer.
- *Domain:* Real, positive numbers. Cannot be NULL.
- *Default:* Minimum number that is not already identifying another item.

Item ID. Integer.

- Foreign key.
- *Name in Database:* item_id
- Data Type: Integer.
- *Domain:* Value must exist in a tuple belonging to the item relation.
- *Default:* NULL.

Contributor ID. Integer.

- Foreign key.
- *Name in Database:* contributor_id
- *Data Type:* Integer.
- *Domain:* Value must exist in a tuple belonging to the contributor relation.
- *Default:* NULL.

Contribution Role. String.

- Foreign key.
- *Name in Database:* role_id
- *Data Type:* Integer.
- *Domain:* Value must exist in a tuple belonging to the contributor role relation.
- *Default:* NULL.

Contribution Role

The *contribution role* relation stores each valid contribution role.

Contribution Role Attributes

Role ID.

- Primary key.
- *Name in Database:* role_id
- *Data Type:* Integer.
- *Domain:* Real, positive numbers. Cannot be null.
- *Default:* Minimum number that is not already identifying another record.

Role Name.

- *Name in Database:* role_name
- *Data Type:* String.
- *Domain:* String that is 15 or less characters in length.
- *Default:* Unknown.

Contributor Role Functional Dependencies

The functional dependencies will be added at a later date.

Genre

The *genre* relation stores each valid genre.

Genre Attributes

Genre ID.

- Primary key.
- *Name in Database:* genre_id
- *Data Type:* Integer.
- *Domain:* Real, positive numbers. Cannot be NULL.
- *Default:* Minimum number that is not already identifying another record.

Genre Name.

- *Name in Database:* genre_name
- *Data Type:* String.
- *Domain:* String that is 15 or less characters in length.
- *Default:* Unknown.

Genre Functional Dependencies

The functional dependencies will be added at a later date.

Item

The *item* relation is the equivalent of the Item entity.

Item Attributes

Item ID.

- Primary key.
- *Name in Database:* item_id
- *Data Type:* Integer.
- *Domain:* Real, positive numbers. Cannot be NULL.
- *Default:* Minimum number that is not already identifying another item.

Item Type.

- *Name in database:* item_type
- *Data Type:* Integer.
- *Domain:* Value must exist in a tuple belonging to the item type relation.
- *Default:* NULL.

Title.

- *Name in Database:* title
- *Data Type:* String.
- *Domain:* String less than 50 characters.
- *Default:* None.

Description.

- *Name in Database:* description
- *Data Type:* String.
- *Domain:* String less than 255 characters.
- *Default:* None.

Genre.

- Foreign key.
- *Name in Database:* genre_id
- *Data Type:* Integer.
- *Domain:* Value must exist in a tuple belonging to the genre relation.

- *Default:* NULL.

ISBN.

- *Name in Database:* ISBN
- *Data Type:* Integer.
- *Domain:* Integer of 10 digits if Publication Year is before 2007, or 13 digits if Publication Year is 2007 or later.
- *Default:* NULL.

Publication Year.

- *Name in Database:* publication_year
- *Data Type:* Integer.
- *Domain:* Integer of 4 digits.
- *Default:* Current year.

Publication Date.

- *Name in Database:* publication_date
- *Data Type:* Date.
- *Domain:* Any existing date with year equaling Publication Year.
- *Default:* Current date.

Publisher.

- *Name in Database:* publisher
- *Data Type:* String.
- *Domain:* String less than 50 characters.
- *Default:* None.

Issue Number.

- *Name in Database:* issue_number
- *Data Type:* Integer.
- *Domain:* Integer greater than 0.
- *Default:* NULL.

Explicit.

- *Name in Database:* explicit
- *Data Type:* Boolean.
- *Domain:* True or False. Cannot be NULL.

- *Default:* FALSE.

Rating.

- Foreign key.
- *Name in Database:* rating_id
- *Data Type:* Integer.
- *Domain:* Value must exist in a tuple belonging to the rating relation.
- *Default:* NULL.

Total Quantity.

- *Name in Database:* total_quantity
- *Data Type:* Integer.
- *Domain*: Integer greater than 0.
- *Default:* 1.

Quantity Available.

- *Name in Database:* quantity_available
- *Data Type:* Integer.
- *Domain:* Integer less than or equal to Total Quantity.
- *Default:* 1.

Reservation Amount.

- *Name in Database:* reservation_amount
- *Data Type:* Integer.
- *Domain:* Integer less than or equal to Total Quantity.
- *Default:* 1.

Item Type

The *item type* relation stores each valid item type.

Item Type Attributes

Item Type ID.

- Primary key.
- *Name in Database:* item_type_id
- *Data Type:* Integer.
- *Domain:* Real, positive numbers. Cannot be null.
- *Default:* Minimum number that is not already identifying another record.

Item Type Name.

- *Name in Database:* item_type_name
- *Data Type:* String.
- *Domain:* String that is 10 or less characters in length.
- *Default:* NULL.

Item Type Functional Dependencies

The functional dependencies will be added at a later date.

Loans

The *loan* relation is the equivalent of the Loan entity.

Loan Attributes

Loan ID.

- Primary key.
- *Name in Database:* loan_id
- *Data Type:* Integer.
- *Domain:* Real, positive numbers. Cannot be NULL.
- *Default:* Minimum number that is not already identifying another record.

Item ID.

- Foreign key.
- *Name in Database:* item_id
- *Data Type:* Integer.
- *Domain:* Real, positive numbers. Cannot be NULL.
- *Default:* NULL.

Account ID.

- Foreign key.
- *Name in Database:* account_id
- *Data Type:* Integer.
- *Domain:* Real, positive numbers. Cannot be NULL.
- *Default:* NULL.

Loan Out Date.

- *Name in Database:* loan_out_date
- *Data Type:* Date.

- *Domain:* Formatted as YYYY-MM-DD. Cannot be NULL.
- *Default:* System-generated at time of loan creation.

Due Date.

- *Name in Database:* due_date
- *Data Type:* Date.
- *Domain:* Formatted as YYYY-MM-DD. Must be later than the Loan Out Date. Cannot be NULL.
- *Default:* System-generated based on Loan Out Date (e.g., Loan Out Date + 14 days).

Return Date.

- *Name in Database:* return_date
- *Data Type:* Date.
- *Domain:* If provided, must be on or after the Loan Out Date and on or before the Due Date unless extended. Can be NULL if the item is not yet returned.
- *Default:* NULL.

Rating

The *rating* relation stores each valid rating.

Rating Attributes
Rating ID.

- Primary key.
- *Name in Database:* rating_id
- *Data Type:* Integer.
- *Domain:* Real, positive numbers. Cannot be null.
- *Default:* Minimum number that is not already identifying another record.

Rating Name.

- *Name in Database:* rating_name
- *Data Type:* String.
- *Domain:* String that is 5 or less characters in length.
- *Default:* NULL.

Rating Functional Dependencies
The functional dependencies will be added at a later date.

Reservation

The *reservation* relation is the equivalent of the reservation entity.

Reservation Attributes

Reservation ID.

- Primary key.
- *Name in Database:* reservation_id
- *Data Type:* Integer.
- *Domain:* Real, positive numbers. Cannot be NULL.
- *Default:* Minimum number that is not already identifying another record.

Item ID.

- Foreign key.
- *Name in Database:* item_id
- *Data Type:* Integer.
- *Domain:* Real, positive numbers. Cannot be NULL.
- *Default:* NULL.

Account ID.

- Foreign key.
- *Name in Database:* account_id
- *Data Type:* Integer.
- *Domain:* Real, positive numbers. Cannot be NULL.
- *Default:* NULL.

Reservation Date.

- *Name in Database:* reservation_date
- *Data Type:* Date.
- *Domain:* Formatted as YYYY-MM-DD. Cannot be a past value. Cannot be NULL.
- *Default:* None.

Reservation End Date.

- *Name in Database:* reservation_end_date
- *Data Type:* Date.

- *Domain:* Formatted as YYYY-MM-DD. Cannot be a past value. Cannot be a future value earlier than Reservation Date. Cannot be NULL.
- *Default:* None.

Item Functional Dependencies

The functional dependencies will be added at a later date.

Schema Diagram
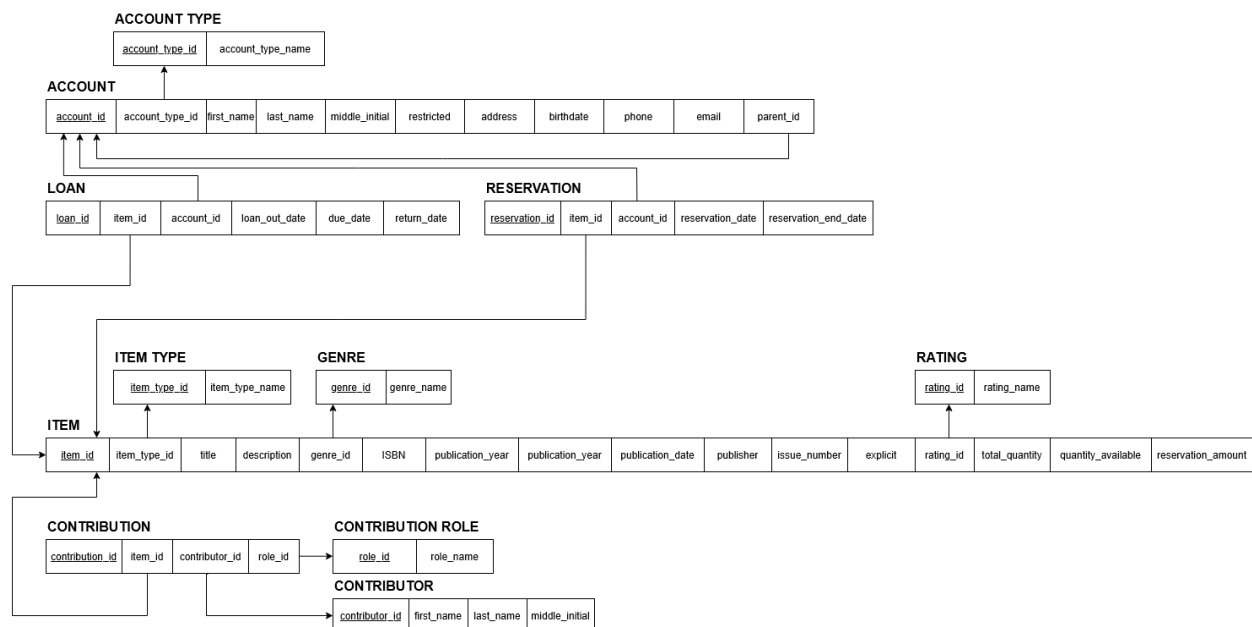
This section contains the logical schema diagram.

Figure 1. The diagram of the logical schema diagram.