Library Management System

Database Project Report

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Introduction

The Library Management System is a digital solution aimed at automating and streamlining the day-to-day operations of a library. Traditional library systems often rely on manual methods for tracking books, issuing loans, and managing member data, which can be inefficient and error-prone. This project provides a structured, database-driven approach to manage library operations efficiently.

Abstract

This project focuses on designing and implementing a relational database system for managing a digital library. Using PostgreSQL and pgAdmin, the system models key entities such as books, authors, members, and loans. The system includes features to support many-to-many relationships (books and authors), monitor borrowing activities, and track overdue returns. Additionally, views and triggers are implemented for real-time insights and alerts. The goal is to ensure efficient record-keeping and improved accessibility of library data.

Tools Used

- **PostgreSQL** – for relational database creation and management

- **pgAdmin** – for executing SQL queries and managing the PostgreSQL server

- **dbdiagram.io** – for designing the Entity-Relationship Diagram

- **SQL (DDL & DML)** – for defining schema and performing data operations

Steps Involved in Building the Project

1. **Schema Design** – Defined tables for Books, Authors, Members, and Loans

2. **Relationship Modeling** – Implemented a many-to-many relationship using a bridge table (books_authors)

3. **Sample Data Insertion** – Populated the database with realistic data for testing

4. **Views Creation** – Created borrowed_books and overdue_books views to filter real-time loan status

5. **Trigger Implementation** – Designed a trigger function that alerts when a due date is near

6. **Report Generation** – Used SQL JOINs and aggregation to generate member loan summaries and overdue counts

Conclusion

The Library Management System successfully demonstrates how database systems can be used to build efficient and scalable library solutions. By normalizing data and implementing automated processes like triggers and views, the system reduces manual workload and improves accuracy in managing loans and inventory. This model can be extended further to incorporate advanced features such as user authentication, reservations, and overdue email alerts, making it a valuable foundation for a fully functional library software system.