

Date of publication September 27th, 2023, date of current version September 27, 2023.

Digital Object Identifier 10.1109/ACCESS.2017.DOI

The Use of MySQL to Display Long Form Content in eReader Web Platform

YI ZHOU¹, SCOTT HARTSELL¹, HANK BENNETT¹, AND MATEO LOPEZ MONCALEANO.¹

¹Middle Tennessee State University, Murfreesboro, TN 37132

This work is a part of the course CSCI 4560/5560 taught by Dr. Khem Poudel at Middle Tennessee State University.

ABSTRACT A challenging aspect of database storage and retrieval is in long form content. The objective of this paper is to develop a web-based retail platform that hosts dynamic reading content and gives users the ability to view and track the content. The motivation for this project came from challenging our knowledge of database management systems, as well as front and back-end web development to extend our experience in industry. This project includes storing the long form text of reading material, meta-data tags for each title, and strategies for pictures to be displayed within the pages. These tags will describe book content in order to recommend new choices to users based on their recent purchases and previous patterns of purchases. Our approach utilizes the MySQL database management system as well as the JavaScript, HTML, CSS, and PHP to transmit, retrieve, and display information from the database.

INDEX TERMS eBook, Javascript, Meta-data, MySQL, Web-based eReader System, Retail System, Recommendation System

I. INTRODUCTION

E READERS have mostly overtaken conventional paper media and have grown in popularity in the fast-moving digital world (cite). These platforms have not only changed how we read literature but also provided us with an interactive and dynamic content experience. The first eReader appeared in the late 1990s, such as the Rocket eBook and Soft Book with simple reading devices (cite). But the most famous eReader is the Amazon Kindle, released in 2007, marking a significant milestone in the history of eBook readers (cite). These eBook readers can support various formats, including EPUB, PDF, etc. Our eReader Database Management System is a web-based platform designed to facilitate the storage, retrieval, and management of eBooks and related data. In addition, the eReader Recommendation system also involves the tracking of title meta-data to give recommendations based on readers' past purchasing patterns, helping readers discover new interesting titles.

There has been a lot of research on eReader Systems. Rosli [1] developed the eBook Recommender System which recommends Malay novels based on information such as the reader's age and gender. Their system website is based on the Waterfall model. The interface design is very simple, irrelevant functions are removed, and only simple language is used on the labels. However, their system cannot read books online and does not support audiobooks. Choi [2] introduced an interactive eReader that supports multimedia,

user interaction, and 3D model view. They used the HTML5 format with JavaScript and CSS. The authors adopted MVC architecture for this system to satisfy the requirements. However, the system still needs to solve the problems of reflow and content protection mechanisms. Mu [3] introduced an Android platform E-Reading System that supports local bookshelf, collection bookshelf, reading theme change, interface font increase and decrease, bookmark management, etc. They also adopted MVC architecture, using Java and SQLite lightweight databases to construct their EReader System.

The objective of this paper is to develop a web-based eBook reading content database platform that allows the user to keep track of the viewing content and the availability of it with a user login and a library personalized for each individual person. The project will count on tools like MySQL database management system to store the data, REACTJS to design the web interface, and PHP to retrieve data from the database efficiently. Our motivation for making this project lies in the interest of increasing our knowledge of database management systems and their relation with front-end and back-end web development. The project doesn't aim to store the full content of books, but several pages of each for proof of concept.

II. SYSTEM DESIGN

The purpose of this stage is to realize the overall requirements of the system and describe the functions of the main modules.

This includes the management of store assets, user purchases, and new recommendations. Figure 1 details the control flow between the web server that the client accesses and the database server that is used to query and return information. When the client connects to the local web server via a socket connection given by 'localhost', they are presented with a portal to log in. This is, by design, the only entry point to the system. For our purposes, we have already created several user accounts. The user's login credentials are then entered and submitted with PHP in a canned transaction to allow access to the rest of the website.

The 'home' page is then displayed, called My Library, which is the heart of the website. From here, the user can access and browse the Store, open and read their Purchases, view generated recommendations for new titles, and details about each title.

A. MY PURCHASE SYSTEM DESIGN

A user's purchases are displayed as hyperlinked tiles that hold a picture of the book cover. The web server queries the database to check tuples in the Purchases table, which holds purchases for all users. If tuples are found for the logged in user by their numerical ID, then the tiles will be returned and displayed. All tiles link to one web page that queries the database and returns content dynamically, versus the method of a series of static web pages. A division in the middle of the page holds each page of the book's content by querying the page number and reassigning current content. The database holds the pages as Hypertext Markup Language (HTML) strings in the MySQL TEXT format in order to preserve formatting and allow only one web page to be used for all requests from a user. The PHP query returns the pre-made HTML string, and the content is displayed within the division. There are controls below to turn pages forward and backward through the pages of each book. When a user exits this web page, a PHP request is sent to the database to update the page that they left off at. This allows the user to quickly exit and return to where they were reading.

B. RECOMMENDATION SYSTEM DESIGN

The Recommendation system involves providing personalized book recommendations based on user behavior and preferences. Typically, books of the same genre are the focus of the recommendation system. Its architecture, web-based user interface, and basic recommendation process are all designed to provide relevant and useful books of a specific genre based on the user's interests [1]. The eReader system may learn about a user's preferences by establishing book type tags, which enables it to suggest books with tags that are comparable to the user's preferences. This database we made, called "genre_tags," has 12 different categories. For the purpose of retrieving book titles and other information using bookID, the recommendation system can reference other tables in the database such as 'book info' and 'library'. The specific operation can be expressed as when a user purchases a book and accesses their recommendations, the

recommendation system will obtain the genres of this book and other user purchases in the "genre tags" table. The system will then query other book IDs in the same database that have similar genres to the book. The top three genres will be selected, and the matches will be displayed from most likely to purchase descending. The user can click a title to access the same detailed web page as from the store to purchase the title.

C. LOG OUT DESIGN

When the user wishes to end their session, they will press the 'Log Out' button in the top right of the navigation bar. This loads a PHP page that clears environment variables from the browsing session, and returns users to the log in page.

III. ER DIAGRAM

In this section, we will discuss the ER diagram of this system. The ER diagram, also called an entity-relationship diagram, is essential for modeling the data stored in a database. It is the basic design for building a database. The ER diagram specifies what data we will store: entities and their attributes. They also show how entities relate to other entities. Figure 2 shows the ER diagram of the eReader Web platform [5]. In the context of this e-book reader network platform, key entities include "user," "ebooks," "library," "genre tags," and "author." These entities encapsulate essential components of the system, delineating users, the digital books available and their related metadata, and recommended books that are classified according to tags. Each entity is characterized by attributes that capture pertinent information. For instance, the "user" entity includes attributes such as "user ID," "username," and "password." The "ebooks" entity includes attributes such as "book ID," "book cover," "title," "publish date," "ISBN," and "summary." The relationships between these entities are crucial in defining how data interacts within the system. For example, the "user" entity is related to the "library" entity, which indicates that the books purchased by the user will be stored in the library.

IV. METHODS

A. DEVELOPMENT ENVIRONMENT

In this project, the development was carried out using XAMPP (Cross-Platform, Apache, MySQL, PHP, and Perl). XAMPP provides a local server environment that includes Apache as the web server, MySQL as the database management system, and PHP as the scripting language. This environment allows for seamless development, testing, and deployment of PHP-based applications, making it well-suited for web development projects.

B. RECOMMENDATION SYSTEM IMPLEMENTATION

Recommendation systems utilize relevant genre tags to generate book recommendations based on user preferences. First, a comprehensive dataset of books with relevant genre labels is collected and user purchase data are merged into the dataset. Second, each book in the dataset is assigned relevant

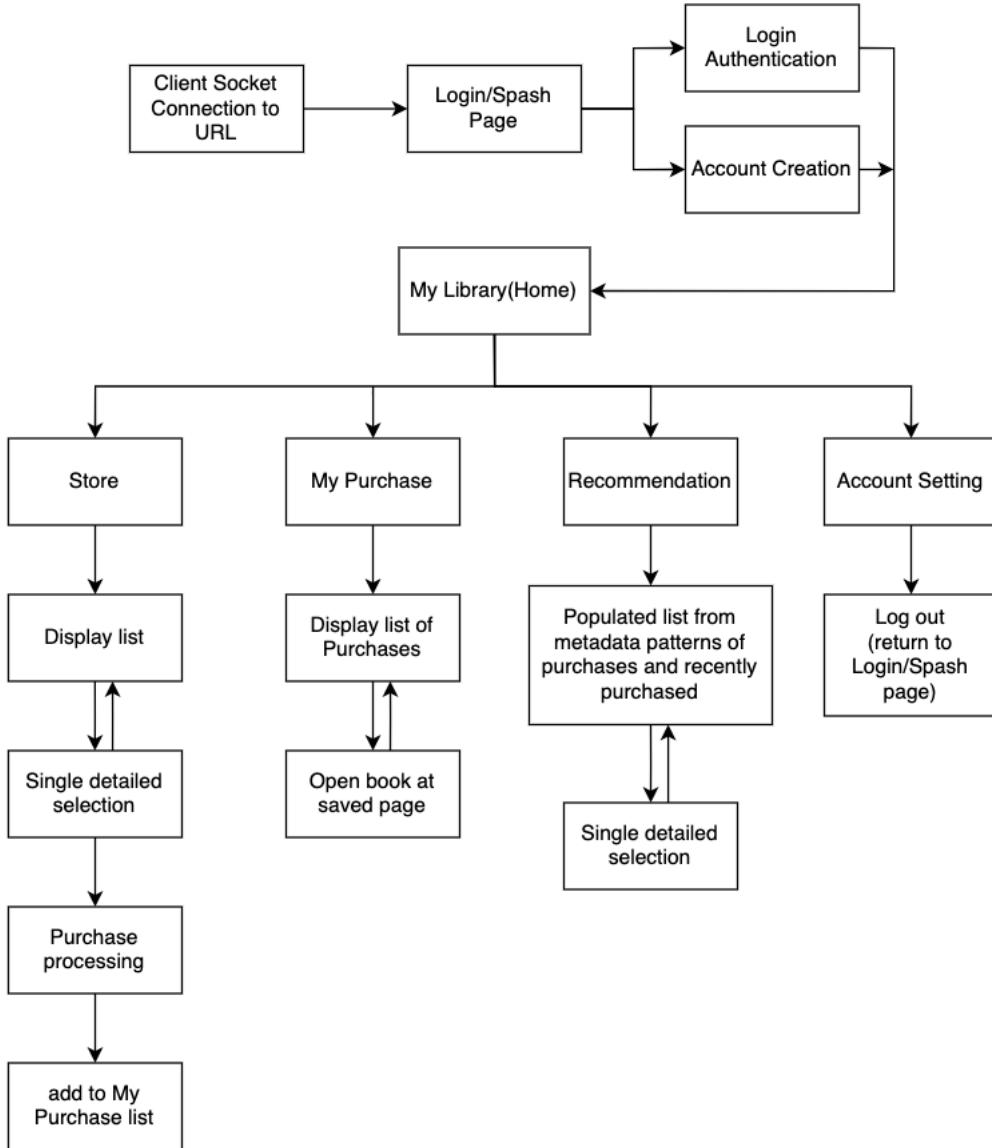


FIGURE 1. eReader web platform diagram.

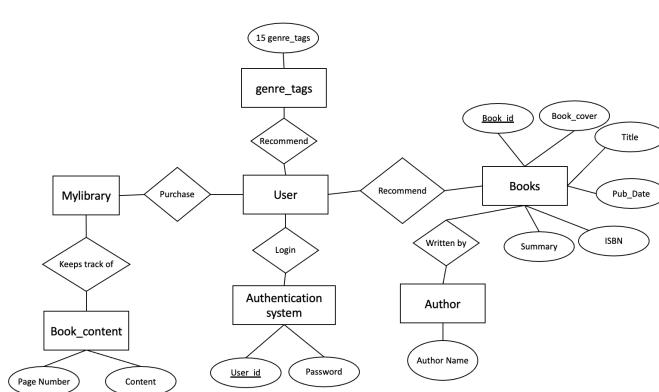


FIGURE 2. eReader web platform ER Diagram

genre labels. Third, understand user preferences and conduct a comprehensive ranking of all book tags based on the books that users prefer. Books that are closer to user preferences are ranked higher.

V. EXPERIMENT RESULTS

In this section, we will discuss the results generated by our system. These results will help us demonstrate that the proposed system can effectively and efficiently provide access to users. A multi-functional database is implemented in the system to store various types of tables and provide table editing, deletion, addition, and other functions. Figure 3-5 shows specific table records in the database, illustrating the variety of data stored and managed by the system.

Figures 6 to 10 illustrate the graphical interface of the

book_id	title	author	pub_date	publisher	summary
1	Think and Grow Rich	Napoleon Hill	1927-02-15	The Relation Society	It's a classic self-help book that has been translated into many languages and is still popular today.
2	Harry Potter and the Prisoner of Azkaban	J.K. Rowling	1999-09-15	Arthur A. Levine Books	A continuation of the Harry Potter series, it features the Marauder's Map and the Ministry of Magic.
3	The Demon Slayer	Koyuki	2014-02-10	Yen Press	A manga series about a girl who becomes a demon slayer and fights alongside her friends.
4	Pride and Prejudice	Jane Austen	1813-01-01	Chivers Brothers	A classic novel about social class and marriage.
5	The Catcher in the Rye	J. D. Salinger	1951-07-16	Little, Brown and Company	A coming-of-age novel about a young man named Holden Caulfield.
6	The War of the Worlds	H. G. Wells	1898-01-01	Signet Classics	A science fiction novel about an alien invasion of Earth.
7	The Burning World	Ruth Rendell	2000-04-09	Pantheon Publishing	A mystery novel about a woman who disappears.
8	The Catcher in the Rye	J. D. Salinger	1951-07-16	Little, Brown and Company	A coming-of-age novel about a young man named Holden Caulfield.
9	Death of a Salesman	Arthur Miller	1947-01-01	Alfred A. Knopf	A drama about a man who loses his job and tries to find meaning in his life.
10	Pride and Prejudice	Jane Austen	1813-01-01	London George Allen	A classic novel about social class and marriage.
11	The Demon Slayer	Koyuki	2017-01-01	Yen Press	A manga series about a girl who becomes a demon slayer and fights alongside her friends.

FIGURE 3. eReader web platform Book information Table

book_id	genre_id	count
1	1	0
2	0	1
3	1	0
4	0	0
5	1	0
6	0	1
7	1	0
8	0	0
9	1	0
10	0	0
11	1	0
12	0	0
13	0	1
14	0	1
15	1	0
16	1	0

FIGURE 4. eReader web platform Book Genre Table

eReader web platform. It provides basic pages on which users and administrators can access our system. Figure 6 shows the administrator login web page where the administrator can log in using the username and password. Figures 7 to 9 showcase the web pages for 'Home,' 'Store,' and 'Recommendation,' respectively. Figure 10 represents the 'Book Detail' web page, which users are directed to upon clicking on each book cover.

VI. CONCLUSION

The pursuit of simplifying life and enhancing efficiency has driven the computerization of numerous processes. Notably, computer technology has revolutionized the way we read books, ushering in a transition from traditional paper books to electronic formats. This study delves into the realm of

user_id	book_id
1	12
1	13
1	14
1	15
2	2
2	3
3	4
3	5
3	6
3	7
3	8
4	9
4	10
4	11
5	2
5	3
5	4
5	5
5	6
5	7
5	8
5	9
5	10
5	11
5	12
5	13

FIGURE 5. eReader web platform library Table

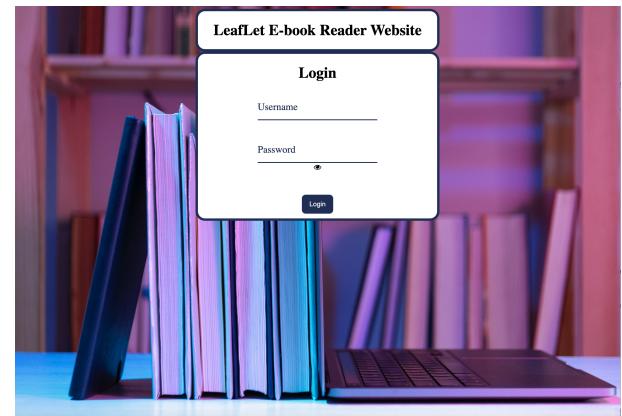


FIGURE 6. eReader web platform Login Page

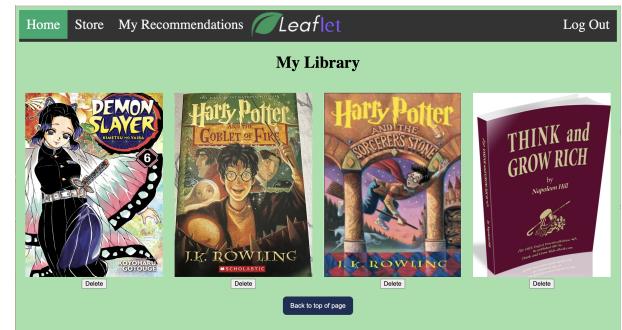


FIGURE 7. eReader web platform Home Page

network platform electronic book database management systems, with a specific focus on the management of various e-book operations. These operations encompass tasks such as purchasing new books, updating user records, and facilitating seamless reading experiences.

In essence, the designed system underwent thorough testing, affirming its usability and reliability as an e-book purchasing and reading platform. The system performs seamlessly, meeting and even exceeding the initially outlined min-

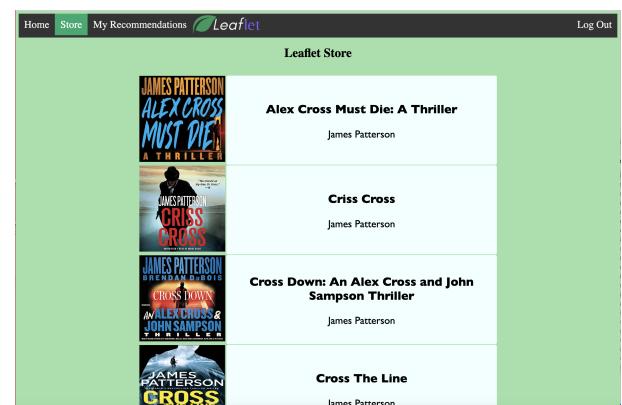


FIGURE 8. eReader web platform Store Page

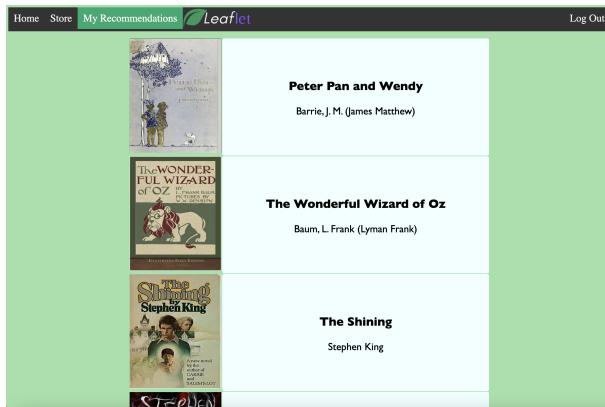


FIGURE 9. eReader web platform Recommendation Page

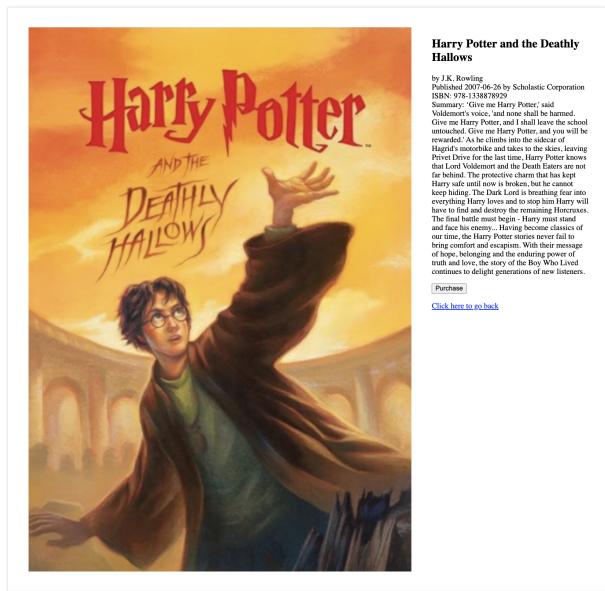


FIGURE 10. eReader web platform Book Details' Page

imum expectations. It stands as a testament to the successful integration of technology into the domain of book consumption, offering users a robust and satisfactory platform for their e-book needs.

REFERENCES

- [1] Rosli, Nurameera Sofea, Wan Hussain Wan Ishak, and Fadhilah Mat Yamin. Web-Based Book Recommender System: Design and Implementation. International Journal of Synergy in Engineering and Technology 3, no. 2 (2022): 42-51.
- [2] Choi, Jongmyung, Youngho Lee, and Kiyoung Kim. Html5 based interactive e-book reader. International Journal of Software Engineering and Its Applications 8, no. 2 (2014): 67-74.
- [3] Z. Mu, Y. Peng and Y. Liu, E-reading system based on android. 2019 12th International Conference on Intelligent Computation Technology and Automation (ICICTA), Xiangtan, China, 2019, pp. 487-491, doi: 10.1109/ICICTA49267.2019.00110.
- [4] Araya, Tsega Weldu, and A. Mengsteab. Designing Web-based Library Management System. International Journal of Engineering Research & Technology 9, no. 10 (2020).
- [5] Vertabelo Team. Why Do You Need an ER Diagram? [https://vertabelo.com/blog/why-need-an-er-diagram/#:~:text=An%20entity%](https://vertabelo.com/blog/why-need-an-er-diagram/#:~:text=An%20entity%2Drelationship%20diagram%2C%20or,entities%20relate%20to%20other%20entities.)

2Drelationship%20diagram%2C%20or,entities%20relate%20to%20other%20entities.