

Splitwise - Streamlining Shared Finances

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Abstract— This project focuses on implementing Splitwise, an efficient expense management system for tracking shared expenses among groups. It includes user management, expense creation and management, group formation, and expense splitting algorithms. With robust user authentication and authorization mechanisms, users can securely access the platform. They can create, update, and delete expenses, invite others to join groups, and utilize various expense splitting methods. Transaction tracking records payments within groups, updating balances accordingly. Splitwise offers insights into spending habits through summarized expenses and generated reports. Data integrity and security are maintained with proper database schemas and access controls, ensuring user information remains safeguarded. Overall, Splitwise provides a comprehensive solution for collaborative expense management.

Keywords—splitwise, expenses tracking, user management, expense splitting algorithms, transaction tracking, security

I. INTRODUCTION

In response to the increasing prevalence of collaborative living and shared financial responsibilities, Splitwise emerges as a pivotal solution for streamlining expense management among groups of individuals. Its versatile platform facilitates seamless collaboration and transparent expense tracking across various contexts, ranging from household expenses among roommates to coordinating finances within shared workspaces. By offering intuitive tools for expense management, user authentication, group collaboration, and financial analysis, Splitwise stands as a cornerstone in fostering financial transparency, accountability, and convenience.

This research paper delves into Splitwise's multifaceted realm, addressing its pivotal role in simplifying complex financial arrangements. Beyond mere expense tracking, Splitwise tackles intricate challenges of relational data management, transaction handling, and algorithmic calculations for equitable distribution of financial obligations. By dissecting its features and technical intricacies, this paper aims to elucidate Splitwise's significance in modern financial management practices, shedding light on its profound impact in revolutionizing shared expense management while offering insights for future innovation in this domain.

II. OBJECTIVE

This project aims to simplify expense management and group finances through a web application. Users can log expenses with descriptions and amounts, categorize them, and collaborate on shared expenses within groups. It features user authentication for secure access, role-based controls, and seamless handling of group requests. The interface is intuitive and responsive, ensuring accessibility across devices. Overall, the project promotes financial transparency, efficiency, and collaboration in managing personal and group expenses.

III. METHODOLOGY

The methodology underlying the Splitwise project is designed to revolutionize the way groups manage shared expenses. From user registration to group administration and payment monitoring, each aspect of the app's functionality is meticulously crafted to simplify the process of splitting bills among friends or roommates. This introduction provides a glimpse into the key features and processes that define the Splitwise experience, setting the stage for a detailed exploration of its functionality and user benefits.

A. Fair Expense Splitting

Splitwise ensures that when a group shares expenses, everyone pays their fair share. It calculates each person's portion of the bill accurately, making sure no one overpaid or underpaid.

B. User Registration

To access Splitwise, users must first sign up on the website using their email address and a password. This ensures that only authorized users can use the app and access its features securely.

C. Group Creation and Administration

Once registered, users can create groups for different circles of friends or activities. The person who creates the group becomes its admin, with the ability to manage group members and oversee expenses.

D. Notification System for Adding Members

When admins add new members to a group, Splitwise notifies them via in-app notifications. This ensures that all members are aware of new

additions and can participate in group activities effectively.

E. Friend Preference Feature

When admins add new members to a group, Splitwise notifies them via in-app notifications. This ensures that all members are aware of new additions and can participate in group activities effectively.

F. Expense Creation and Division

Group admins can create expenses within Splitwise, specifying the total amount and how it should be divided among members. Whether splitting costs equally or based on custom ratios, the app handles the calculations effortlessly.

G. Monitoring Pending Payments

Splitwise helps keep track of who owes what within a group. If someone has an outstanding balance, they can settle it directly with the group admin through the app, ensuring transparency and accountability.

H. Exclusive Payments between Friends

In addition to group expenses, Splitwise allows users to make one-on-one payments to friends within the app. This feature enables individuals to handle personal transactions separately from group finances.

I. Timely Reminders

Integrated a notification system that sends reminders to users who owe money to others. Set up a schedule for reminders based on the due date or a customizable time frame. Included an option to clear all reminders.

J. Transaction Record

Created a database table which stores transaction records securely. Includes fields such as date, time, description, amount, payee, payer, and group for each transaction. Provided users with access to their transaction history, allowing them to view details of past transactions

K. Search Among Users

Users can search among the users available in the website and send them invites.

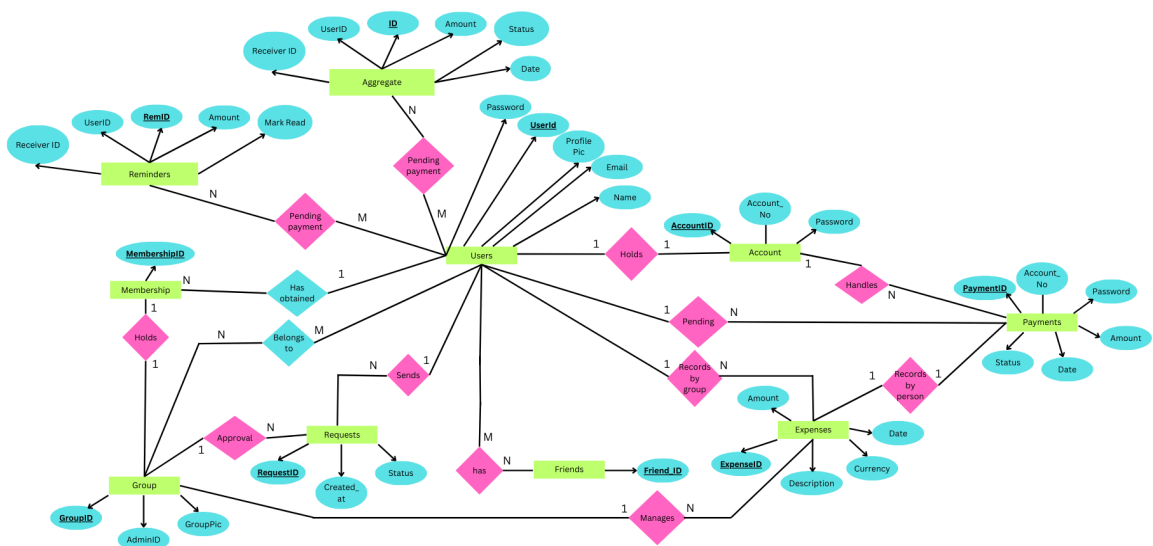


Fig 1: Entity Relationship diagram of the Database

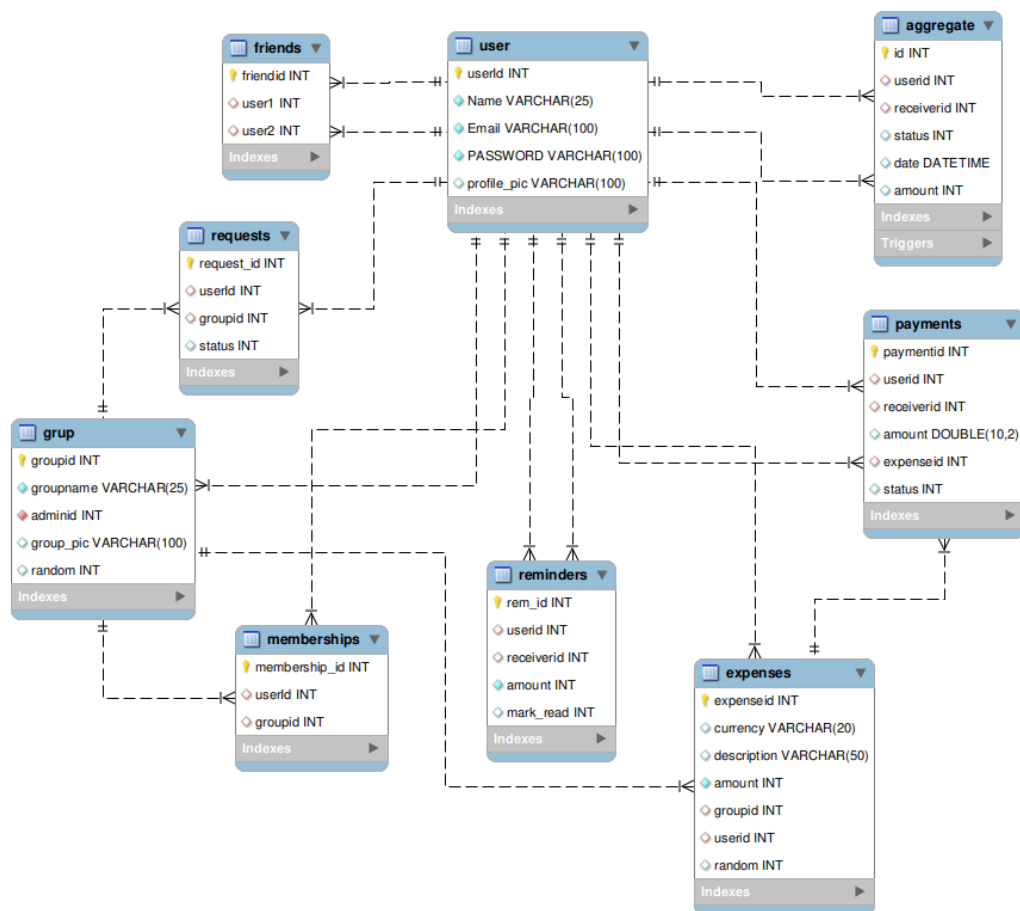


Fig 2: Database Schema

IV. IMPLEMENTATION

In the implementation phase, we leverage a robust tech stack combining Node.js and Express for the backend, MySQL for database management, and a combination of HTML, CSS, and JavaScript for crafting a dynamic and intuitive frontend interface.

A. Database Management

Here are the MYSQL tables used in our Splitwise project:

- **Account:** This table stores user account information, including unique identifiers, email addresses, and passwords. It's essential for user authentication and access control within the application.
- **Expenses:** The expenses table records details about individual expenses incurred within groups, including descriptions, amounts, currencies, and dates. It facilitates expense tracking and enables the equitable splitting of bills among group members.
- **Friends:** This table manages relationships between users who are identified as friends within the application. It typically stores user IDs or other identifiers for mapping friend connections, enabling features such as shared expense visibility and communication.
- **Group:** The group table is likely used for group management, storing information such as group names, administrator IDs, group profile pictures, and other relevant group-related data. It facilitates the creation, administration, and organization of expense-sharing groups within the app.
- **Memberships:** This table maintains associations between users and the groups they belong to. It helps determine group memberships, allowing users to participate in shared expenses and other group activities.
- **Payments:** The payments table tracks transactions between users, including details such as expense IDs, payer IDs, receiver IDs, amounts, statuses, and dates. It enables the settlement of expenses and facilitates payment tracking and reconciliation within the application.

- **Requests:** This table handles requests initiated by users, such as joining group requests or other user-generated actions within the app. It helps manage user interactions and permissions, ensuring smooth collaboration and communication within the Splitwise platform.
- **User:** The user table stores essential user profile information, including names, email addresses, passwords, and profile pictures. It serves as a central repository for user data, enabling user authentication, profile management, and personalized user experiences within the application.
- **Aggregate:** The aggregate table serves as a centralized repository for storing aggregated data related to user transactions, expenses, and payments within the Splitwise application.
- **Reminders:** This table enables the system to track reminder details such as the involved parties' IDs, the amount associated with the reminder, and a flag to mark if the reminder has been read, ensuring timely notifications.

B. Web Functionalities

To begin with, the login and signup pages ensure secure access to user-specific data and features while maintaining the integrity of user credentials and personal information. In case of invalid credentials, appropriate error messages are displayed, prompting the user to retry or reset their password. Here are the other routes used within our project:

- **AddGroup**

This route handles the creation of a new group that processes the form data, including the group name and optional group picture upload, and performs the necessary database operations to create a new group entry.

- **GroupDetails**

The primary functionality of this component is to display details of a specific group, including its name, picture, admin details, and member list. This also allows the users to create a new expense within the group by submitting the expense details

through the provided form. Group admins can invite new members to the group and add their friends to the group.

- **MyGroups**

The primary functionality of this component is to display a list of groups to which the user belongs and view additional details about that group.

- **NotRequests**

The primary functionality of this file is to display a message informing the user that there are no new requests to show.

- **Pay**

This route provides a straightforward interface for users to view payment details such as payment amount, receiver's user ID, and the user's password and proceed with making a payment to the specified recipient.

- **Payments**

This component provides a user-friendly interface for viewing and initiating payments to multiple recipients, displaying relevant payment details such as the recipient's name, profile picture, total amount to be paid and descriptions related to the payment for each recipient.

- **Profile**

The profile page serves to display user information and transactions.

- **Requests**

This template serves to display new requests for joining groups, along with the group's admin details allowing the user to accept or decline each request.

- **Transactions**

This template includes a user-friendly interface that allows users to input expense details such as description, total amount, and split type and also provides the ability to add multiple users to the expense, either equally or with custom ratios.

V. RESULTS

As a result of the enhancements made to the Splitwise project, users now benefit from streamlined expense management and improved accountability. The introduction of timely reminders ensures that individuals stay on top of their financial commitments, receiving

notifications when they owe money to others. Additionally, the implementation of a transaction record feature provides users with easy access to a comprehensive history of all financial transactions within the app, facilitating transparency and aiding in tracking expenses. These enhancements enhance the overall user experience, empowering users to manage shared expenses efficiently and fostering trust and collaboration within groups.

VI. FUTURE WORKS

- **Enhanced UX:** Implement responsive design principles and gather user feedback for interface improvements.
- **Advanced Expense Analysis:** Incorporate predictive analytics for budget planning based on spending trends.
- **Enhanced Security Measures:** Implement multi-factor authentication for heightened account security.
- **Community Engagement and Social Features:** Introduce gamification elements to encourage active user participation.
- **Localization and Global Expansion:** Localize the interface for diverse user bases and explore international markets.
- **Hosting:** We will host the website to ensure optimal performance, reliability, and security, allowing users seamless access to the platform's features and functionalities.
- **Payment Gateway Integration:** Integrate a secure payment gateway to facilitate seamless transactions within the platform, enhancing user convenience and enabling various financial activities.

VII. ACKNOWLEDGMENT

The project titled "Splitwise - Streamlining Shared Finances" was an opportunity for us to explore the field of Database management systems. We would like to extend our heartfelt thanks to **Dr. Shrutilipi Bhattacharjee** and **Prof. Anita S.R** for providing us with invaluable guidance and support throughout the course of the project. Her constant encouragement and constructive feedback helped us stay focused and motivated.

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