**SPLIT EXPENSES TRACKER**

A Project Report

submitted in partial fulfillment of the requirements

of

…………….Track Name Certificate……

by

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**ACKNOWLEDGEMENT**

We would like to take this opportunity to express our deep sense of gratitude to all individuals who helped us directly or indirectly during this thesis work.

Firstly, we would like to thank my supervisor, Umamasheshwari R for being a great mentor and the best adviser I could ever have. His advice, encouragement and critics are source of innovative ideas, inspiration and causes behind the successful completion of this dissertation. The confidence shown on me by him was the biggest source of inspiration for me. It has been a privilege working with him from last one year. He always helped me during my thesis and many other aspects related to academics. His talks and lessons not only help in thesis work and other activities of college but also make me a good and responsible professional.

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#### This Acknowledgement should be written by students in your own language (Do not copy and Paste)

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#### ABSTRACT

**The Split Expenses Tracker is a sophisticated web application engineered to simplify and streamline expense tracking and management for individuals and groups. It harmonizes a robust backend constructed with Node.js and MongoDB for resilient data storage, with a dynamic and user-centric frontend developed using AngularJS.**

#### AIM

**It aims to address the challenges faced in managing shared expenses during group activities, family outings, and small-scale resource management scenarios. User-friendly interface accessible to individuals participating in shared expenses scenarios, ensuring ease of input, tracking, and settlement. Enable transparent and equitable distribution of expenses among participants, ensuring accuracy and fairness in calculating owed amounts and settlements.**

#### OBJECTIVE

**Design and develop a web-based platform leveraging nodejs and mongodb to establish a robust backend infrastructure for efficient expense management. Create a responsive and intuitive user interface using HTML, CSS, and JavaScript to facilitate easy expense input, tracking, and visualization for participants. Implement functionalities to record and categorize expenses, capturing details such as payee, amount, date, and purpose of expenditure for accurate tracking. Develop algorithms to calculate individual owed amounts based on contributed expenses and enable clear visualization of owed balances for settlements.**

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**CHAPTER 1**

**INTRODUCTION**

**CHAPTER 1**

**INTRODUCTION**

1. **Problem Statement:**

In various scenarios such as group trips, family outings, small company resource management, and everyday shopping among friends, individuals frequently encounter challenges in effectively tracking, managing, and settling shared expenses. These situations often involve multiple individuals purchasing items, services, or resources, leading to complexities in expense distribution and payment settlement.

1. **Problem Definition:**

1. Expense Aggregation: During trips or group activities, multiple purchases are made by different individuals for products, services, travel, and meals, leading to a diverse range of expenses that need to be consolidated and managed efficiently.

2. Unequal Payment Distribution: In situations where one person covers expenses for the entire group or family, difficulties arise in accurately determining the amounts owed by each participant. Equally dividing expenses or accounting for individual contributions becomes a cumbersome task.

3. Difficulty in Tracking: Individuals often struggle to keep track of who owes money to whom, the specific amounts owed, and how much has been reimbursed, leading to confusion and potential discrepancies in settling expenses.

1. **Expected Outcomes:**

**Functional Outcomes:** User-Friendly Interface, Recording and Categorization, Transparent Expense Distribution, Security Measures.

**Non-Functional Outcomes:** Scalability, Accessibility, Reliability, Usability.

1. **Organization of the Report**

a) Clarity and Conciseness: The report should be clear, concise, and easy to understand for the target audience. Avoid jargon and overly technical terms.

b) Logical Flow: Information should be presented in a logical flow, with each section building upon the previous one. Use headings and subheadings to guide the reader through the report.

c) Completeness: Include all necessary information related to the project, including objectives, methodologies, results, conclusions, and recommendations. Do not leave any critical information out.

d) Professional Presentation: Use a professional format with consistent fonts, margins, and spacing. Consider adding visuals like charts and graphs to enhance understanding.

**CHAPTER 2**

**LITERATURE SURVEYCHAPTER 2**

**LITERATURE SURVEY**

1. **Paper-1**

**Robust Real-Time Face Detection by Paul Viola and Michael A. Jones, 2003**

* 1. **Brief Introduction of Paper:**

1. **Existing Split Expenses Tracker Applications:**

* Identify and analyze existing apps in the market.
* Compare and contrast their features, functionalities, target audience, user interface, and strengths/weaknesses.
* Focus on successful apps like Splitwise, Tricount, and Settle Up.
* Consider niche apps targeting specific groups (housemates, travelers, families, etc.).

2. **Relevant Research and Studies:**

* Explore research on financial behavior, group dynamics, and shared expenses.
* Analyze studies on budgeting, debt management, and financial decision-making.
* Consider research on user preferences for expense tracking tools and mobile app design.

3. **Related Technologies and Trends:**

* Investigate advancements in mobile app development technologies (e.g., AI, machine learning, blockchain).
* Analyze trends in personal finance and fintech that could impact your app's functionality.
* Consider integration with existing payment systems or financial products.
  1. **Techniques used in Paper:**

**Keyword Search and Filtering**:

* Use relevant keywords like "split expenses," "personal finance tracker," "mobile app," "financial technology," "user behavior," and "group dynamics" to search in academic databases, market research reports, and industry publications.
* Leverage advanced search features like Boolean operators ("AND," "OR," "NOT") to refine your results and target specific aspects.
* Filter results by publication date, source type (peer-reviewed vs. industry reports), or study methodology to focus on the most relevant and recent information.

**Snowballing and Citation Tracking:**

* Start with a few key studies or articles directly related to your app's concept.
* Analyze the references and citations within these studies to identify additional relevant sources.
* Use citation tracking tools like Scopus or Web of Science to discover articles referencing those initial studies,uncovering broader connections and emerging trends.

**Text Analysis and Topic Modeling:**

* Utilize tools like Voyant Tools or MALLET to analyze the text of your collected literature.
* Identify recurring keywords, phrases, and topics that highlight areas of focus and user needs.
* Visualize the relationships between different themes and concepts to gain deeper insights and potential research gaps.

**Comparative Analysis and Synthesis:**

* Compare and contrast findings from different studies, identifying similarities and differences in user preferences, technology trends, and market landscape.
* Synthesize the extracted information to formulate key takeaways and develop a strong understanding of the field surrounding split expenses tracker apps.

**Critical Evaluation and Gap Analysis:**

* Critically evaluate the research you encounter, considering its methodology, limitations, and potential biases.
* Identify gaps in existing knowledge or areas where current research doesn't address pressing user needs.
* Leverage these gaps to position your app as a solution to unmet challenges and address user pain points effectively.

**CHAPTER 3**

**PROPOSED METHODOLOGYCHAPTER 3**

**PROPOSED METHODOLOGY**

* 1. **System Design**
     1. **Registration**:
* Username: Allow users to choose usernames for personalized identification within the app.
* Optional Information: Gather additional details like name, date of birth, currency preference, etc., to personalize the app experience and tailor features.
* Social Connection: Enable users to connect with friends and family for easier group expense tracking and settlement. This can be through social networks, contact lists, or QR code scanning.
  + 1. **Recognition:**
* 1. Points and Badge
* 2. Leaderboards and Ranking System
* 3. Social Recognition and Recommendations
* 4. Automated Feedback and Challenges
* 5. Integration with Existing Rewards Programs
  1. **Modules Used**
     1. **Face Detection:**
* Automatic Participant Identification
* Automatic Bill Splitting
* Security and Privacy Concerns
* Technical Considerations
* Alternatives to Face Detection
  1. **Data Flow Diagram**

A Data Flow Diagram (DFD) is a graphical representation of the "flow" of data through an information system, modeling its process aspects. A DFD is often used as a preliminary step to create an overview of the system, which can later be elaborated. DFDs can also be used for the visualization of data processing (structured design).

* + 1. **DFD Level 0**

This Level 0 DFD provides a high-level overview of the data flow within a split expenses tracker app with face detection capabilities.

* + 1. **DFD Level 1 - Student Face Registration Module:**
* Student: Provides student information and facial image for registration.
* Database: Stores student data and facial templates.

* + 1. **DFD Level 1 - Student Face Recognition Module:**

Each detected face is compared to the stored student faces in the Students Database using a facial recognition algorithm.

* + 1. **DFD Level 1 - Concentration Analysis Module:**
* Data Entry: Users input transactions manually or import data from financial institutions.
* Transaction Processing: App analyzes transactions, extracting relevant information like date, amount, category,currency, and participants.
* Concentration Analysis: System identifies and flags transactions based on:
  + Amount: High-value transactions or unusual spending patterns.
  + Category: Specific categories exceeding budgets or requiring attention.
  + Participants: Frequent spenders, unequal splits, or potential debt issues.
* Reporting and Analysis: App generates reports summarizing expenses, debt balances, category breakdowns,and insights based on concentration analysis.
* User Actions: Users can view reports, edit transactions, adjust budgets, and manage participant details.
  1. **Advantages**
* Simplifies Expense Tracking: It eliminates the need for manual calculations and tedious spreadsheets, keeping track of finances with ease.
* Improves Accuracy: Reduces human error in calculations and ensures transparent and fair expense splitting.
* Enhances Group Budgeting: Helps manage shared expenses with friends, family, or roommates, preventing potential arguments and fostering financial transparency.
* Provides Insights and Analytics: Offers visual breakdowns of spending patterns, enabling users to make informed financial decisions.
* Streamlines Bill Payments: Integrates with payment systems for convenient group bill settlements, eliminating the need for cash exchanges.
* Boosts Organization: Maintains a centralized record of shared expenses, accessible by authorized users at any time.
* Offers Security and Privacy: Secure data storage and user authentication protect sensitive financial information.
  1. **Requirement Specification**

* User Management:
  + Account creation and login
  + Profile management (name, avatar, etc.)
  + Group creation and management
  + Adding and inviting members to groups
* Expense Tracking:
  + Adding expenses with details (amount, date, category, payee, etc.)
  + Uploading receipts or photos for evidence
  + Ability to edit and delete expenses
  + Recurring expense creation for regular bills or subscriptions
* Splitting Expenses:
  + Equal split among all members
  + Custom split based on percentages or individual amounts
  + Automatic calculations based on predefined rules (e.g., tax, tip)
  + Advance settlement feature to account for individual payments
* Debt Management:
  + Real-time balances displayed for each member in a group
  + Notifications for outstanding debts and reminders for payments
  + Option to settle debts within the app or offline
* Reporting and Analytics:
  + Individual and group spending reports based on date, category, etc.
  + Visualizations like charts and graphs for analyzing spending trends
  + Exporting reports in various formats (PDF, CSV, etc.)
    1. **Hardware Requirements:**
* Mobile App: Recent smartphone (3GB+ RAM, 32GB+ storage)
* Web App: Computer with modern web browser

**Software Requirements:**

**Mobile App:**

* + Operating System: iOS 15+ or Android 10+
  + Mobile App Framework: React Native, Flutter, or native frameworks (Swift/Kotlin)
  + Databases: Cloud-based databases like Firebase, AWS DynamoDB, or Azure Cosmos DB
  + Security libraries for data encryption and secure communications
* **Web App:**
  + Modern web browser (Chrome, Firefox, Safari)
  + Web App Framework: React, Angular, Vue.js, or Node.js frameworks
  + Backend server with database (e.g., MySQL, PostgreSQL) and security measures
  + API for communication between mobile app and server

**CHAPTER 4**

**Implementation and Result**

**CHAPTER 4**

**IMPLEMENTATION and RESULT**

1. **Results of Face Detection**

**Positive Results:**

* Convenience and speed: Face detection can automatically identify participants in group expenses, saving time and eliminating the need for manual entry.
* Accuracy and fairness: In ideal scenarios, it can improve accuracy by potentially mitigating human error in remembering who participated in what. This can lead to fairer bill splitting, especially for large groups.
* Enhanced user experience: It can add a unique and innovative element to the app, potentially increasing user engagement and satisfaction.
* Accessibility features: For users with disabilities or challenges typing, face detection can offer a more accessible way to interact with the app.

**Negative Results:**

* Privacy concerns: Face detection raises privacy concerns, as it involves collecting and storing biometric data.Ensure transparent user consent, secure data storage, and clear explanations of how data is used.
* Bias and discrimination: Facial recognition algorithms can be biased based on training data, potentially leading to unfair or discriminatory outcomes. Choose algorithms that are demonstrably fair and avoid using face detection in situations where bias could lead to harm.
* Technical challenges: Real-time face detection requires significant computational resources and can be affected by lighting, angles, and facial coverings. Ensure efficient performance and consider offering alternative options for identifying participants.
* Ethical considerations: The very concept of automatically tracking and recording people's expenses through face recognition raises ethical concerns. Consider user expectations and potential societal implications before implementing this feature.

1. **Results of Face Recognition**

**Positive results:**

* Automatic participant identification: Faces can be automatically identified from photos or videos, saving time and effort in adding participants to a group bill. This can be especially helpful for large groups or recurring outings.
* Improved accuracy: Face recognition can be more accurate than manual name entry, especially when dealing with large groups or unfamiliar people. This can reduce errors and ensure everyone in the group is included in the bill split.
* Convenient bill splitting: Bills can be automatically split based on the identified faces, eliminating the need for manual calculations or arguments about who owes what. This can simplify the process and avoid potential conflict.
* Enhanced security: Face recognition can add an extra layer of security to the app, as only authorized users can be added to a bill. This can be helpful for preventing unauthorized access or fraud.

**Negative results:**

* Privacy concerns: Face recognition technology raises privacy concerns, as it involves collecting and storing biometric data. It's crucial to obtain explicit user consent and implement strong security measures to protect user data.
* Bias and discrimination: Facial recognition algorithms can be biased based on the data they are trained on.This could lead to inaccurate identification or discrimination against certain groups of people. It's important to choose algorithms that are demonstrably fair and avoid using face recognition in situations where bias could be a problem.
* Technical limitations: Face recognition technology is not perfect and can be affected by factors like lighting,angles, and facial expressions. This could lead to inaccurate identification or malfunctioning in certain situations.
* User resistance: Some users might be uncomfortable with the idea of using face recognition in a financial app.It's important to be transparent about how the technology works and address any concerns users may have.

1. **Result Of Concentration Analysis**

1. Concentration Analysis of User Activity:

* This could involve analyzing the app usage data to identify trends in how users interact with expense tracking and splitting features.
* Such analysis might reveal:
  + Which user groups are most active (young professionals, families, etc.)
  + What features are used most frequently (expense entry, bill splitting, reporting)
  + How often groups are used, and the average group size
  + User behavior patterns (frequency of tracking expenses, time of day when activity peaks)

2. Concentration Analysis of Expense Categories:

* This could involve analyzing the breakdown of expenses users track across different categories like:
  + Food and dining
  + Transportation
  + Entertainment
  + Housing
  + Utilities
  + Bills
* This analysis could reveal:
  + Which category holds the highest total or average spending
  + How spending patterns vary across user groups or locations
  + Identify potential areas for saving or budgeting by highlighting unnecessary or excessive spending.

3. Concentration Analysis of Individual Spenders:

* This could involve analyzing the spending patterns of individual users within a group:
  + Identify who frequently contributes more or less to group expenses
  + Calculate individual balances and outstanding debts within a group
  + This analysis could be used to suggest adjustments to bill splitting ratios or encourage fair and balanced contribution among group members.

4. Concentration Analysis of Payment Methods:

* This could involve analyzing how users prefer to pay and settle bills within the app:
  + Identify the most popular payment methods (Cash, Bank transfers, Mobile wallets)
  + Track the success rate of different payment methods and identify potential issues
  + This analysis could help inform decisions about integrating additional payment options or optimizing existing ones for a seamless user experience.

**CHAPTER 5**

**CONCLUSIONCHAPTER 5**

**CONCLUSION**

**ADVANTAGES:**

**For Individuals:**

* Simplified Tracking: No more juggling receipts or relying on mental calculations. Easily record and categorize expenses in a central location.
* Accuracy and Clarity: Eliminate errors and confusion regarding who owes what for shared expenses. The app automates calculations and keeps a clear record of transactions.
* Budgeting Insights: Gain valuable insights into your spending habits by analyzing expenses by category, payee,or timeframe. This can help you set and track your budget goals more effectively.
* Reduced Debt and Reminders: Avoid awkward IOUs and forgotten payments. Send reminders and settle debts within the app to keep everyone accountable and up-to-date.
* Personal Security: Store receipts and important financial information securely within the app, minimizing the risk of losing paper trails or forgetting crucial details.
* For Groups:
* Fairness and Transparency: Ensure everyone contributes their fair share to shared expenses, whether it's rent,groceries, dining out, or vacation costs. Clear calculations and breakdowns prevent any misunderstandings.
* Reduced Conflict: Eliminate arguments and confusion about who owes what. The app removes ambiguity and promotes open communication around finances within the group.
* Efficient Splitting: Quickly and easily split bills based on custom percentages, equal shares, or individual items,catering to different spending habits and contributions.
* Group Expense Management: Keep track of group expenses collectively, including shared purchases, utilities,or event planning. The app can act as a central hub for financial organization and communication.
* Simplified Group Payments: Facilitate convenient and secure group payments through integrations with payment platforms, reducing the need for individual cash transactions and simplifying settlements.

Overall, a split expenses tracker app can:

* Save time and effort on managing shared finances.
* Improve accuracy and transparency in expense tracking.
* Promote fairness and reduce financial conflicts within groups.
* Provide valuable insights for personal and group budgeting.
* Enhance communication and collaboration regarding shared expenses.

**SCOPE:**

* Real-time group updates: Automatically update group bills and balances as expenses are added or edited,fostering transparency and accountability.
* Location-based suggestions: Recommend nearby restaurants, bars, or activities based on user preferences and group location.
* Integration with financial institutions: Connect with bank accounts or payment apps to automatically import transactions and simplify expense tracking.
* Automatic bill splitting with AI vision: Use image recognition to analyze receipts and automatically split bills based on items purchased (useful for restaurants or group shopping).
* Debt reminders and payment automation: Send automated reminders for outstanding debts and integrate with payment systems for secure settlements within the app.
* Recurring expenses management: Set up recurring expenses and automate bill payments or reminders.
* Customizable groups and projects: Create separate groups for different circles of friends or colleagues, and track expenses for specific projects or events.
* Investment tracking: Allow users to track their investments within the app, providing a holistic view of their financial health.

**Additional Scopes:**

* Subscription model: Offer premium features like advanced reporting, priority customer support, or exclusive budgeting tools through a subscription model.
* Business-oriented features: Develop dedicated features for businesses, like employee expense management,invoicing, and tax reporting.
* Internationalization and localization: Support different languages and currencies to cater to a broader user base.
* Community and social features: Facilitate interaction within groups, like sharing recommendations, budgeting tips, or planning future outings.

**REFERENCES**

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**APPENDIX**