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BMShare Ride: Implementing a Ride-Pooling App for Enhanced Community Transportation

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Abstract: Our project focuses on developing an Android-based ride-pooling app using Android Studio, Java, Firebase, and Google Maps API. The app allows users to create and join pools for convenient and efficient transportation within the BMSCE college community. The backend is implemented using a Golang server we built, Firebase Firestore, and Firebase Authentication. The app features user authentication, map-based selection of start and destination locations, pool creation with customizable options, real-time ride status updates, payment integration, feedback system, and various API endpoints for pool management.

Keywords: ridesharing, geohashing, golang, firebase, android

I. INTRODUCTION

Transportation challenges within college campuses, such as BMSCE, pose significant hurdles for students. These challenges arise due to a multitude of factors, including the increasing number of students, limited parking spaces, and inefficient transportation systems. As a result, students often face difficulties in finding convenient and reliable transportation options, leading to issues like traffic congestion, wasted time, and environmental concerns. One of the primary reasons behind these challenges is the lack of a comprehensive transportation system tailored to the specific needs of college communities. There are frequently many separate automobiles on the road since there are ineffective ways to link students moving in the same route or to similar locations. This not only exacerbates traffic congestion but also contributes to increased fuel consumption, carbon emissions, and parking shortages. At the same time, conventional mobility methods like cars or buses aren't usually designed for the special needs of college campuses. These modes may not effectively cater to the dynamic schedules and varied travel patterns of students, leading to inconvenience and wasted resources. Moreover, the financial burden of individual commuting, including fuel costs and parking fees, can strain students' budgets. To address these transportation challenges and create a more sustainable and efficient commuting environment, we are developing a ride-pooling app specifically designed for the BMSCE college community. By allowing students to share rides, the app hopes to reduce the number of vehicles on the road and encourage a more environmentally friendly transportation culture.

II. OBJECTIVES

Our project aims to address the transportation challenges faced by students at BMSCE college by developing and implementing a ride-pooling app. The primary objective of our app is to enhance transportation efficiency within the college campus. We want to reduce the number of individual automobiles on the road, which will ease traffic congestion and maximize the use of transportation resources, by encouraging students to share rides. This not only leads to shorter travel times but also promotes a more sustainable transportation system by minimizing fuel consumption and carbon emissions. Additionally, ride-pooling fosters a sense of community among students, as they come together to share common commutes and build connections with their peers.

Another objective of our app is to enhance accessibility and convenience for students. Students can choose their start and destination places, indicate their preferred gender for ridesharing, and set limit lengths for looking for available rides with ease thanks to a user-friendly interface that relates to Google Maps. Students can find suitable rides quickly and effectively thanks to this, which saves them time and effort on their daily commutes. Moreover, the app provides real-time tracking of rides, allowing users to monitor the progress of their journey and plan their time accordingly. By facilitating convenient and reliable transportation options, our app aims to enhance the overall college experience for students.

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III. METHODOLOGY

The development of our ride-pooling app involves the utilization of various technologies and frameworks to ensure a seamless user experience. The front-end of the app is being created using Android Studio and Java. We have incorporated Firebase Authentication as the back-end for user login, which restricts access to only users with BMSCE email IDs, ensuring the app's usage within the college community. Google Maps API integration enables users to select their start and destination locations, providing a user-friendly interface for creating and joining ride pools.

To calculate distances and proximity, we utilize the concept of geohashing. Geohashing is a method that converts geographical coordinates into a string of characters, allowing for efficient storage and retrieval of locations. By employing geohashing techniques, our app can determine the proximity of ride pools to the starting location, rider's destination, and other relevant criteria.

The app's front-end functionality consists of two primary features: Create Pool and Join Pool. In the Create Pool feature, users can specify the available seats available, preferred gender for the pool, and maximum waiting time. The pool creator possesses the authority to accept or decline requests from other users once the pool is created. When the ride is ready to begin, the pool creator can initiate the ride, and all members gather at the designated start location. Alternatively, if the ride fails to meet the required number of members or any unforeseen circumstances arise, the pool creator has the option to cancel the ride. During the ride, users are prompted to press an end button upon completion. Additionally, our app incorporates a payment system that generates a QR code with UPI (Unified Payments Interface) for secure and convenient transactions. The total cost is divided equally among the pool members, promoting cost-sharing and fairness. Furthermore, a feedback system is implemented, allowing the pool creator to rate the members based on ride experience.

The backend of our app is powered by Firebase Firestore, Firebase Authentication, Google Maps API, and a self-built Golang server. The Golang server handles HTTP POST requests and provides various API endpoints for different activities. Here are the key API endpoints:

- "pool/create_pool": Creates a document in Firestore to store essential data for further APIs.
- "pool/get_pools": Retrieves pools that satisfy specific criteria, including proximity to the starting location, host's preferred gender, pool status, available seats, and proximity to the rider's destination.
- "pool/start_pool": Updates the pool status to indicate that it has started and is no longer accepting new requests.
- "pool/end_pool": Updates the pool status to indicate completion and records the completion time.
- "pool/join_pool": Allows a member to join a pool, updating the pool document and removing any previous requests from other pools.
- "pool/req_join_pool": Enables users to update a particular pool with their request.
- "pool/leave_pool": Allows a rider to exit a pool.
- "pool/user_joined": A helper function for "join_pool" that removes the rider's references from all other pools.
- User-related API endpoints:
- "user/updateFeedback": Employs a steam average algorithm to update a user's rating based on feedback.
- "user/get_user": Retrieves a JSON object containing user details.
- "user/set_user": Creates a new user document in Firestore using the provided ID as its document ID.

By incorporating geohashing and utilizing these technologies, frameworks, and API endpoints, our ride-pooling app aims to deliver a seamless and efficient experience for users in organizing and participating in shared rides while accurately calculating distances and proximity for enhanced convenience.

IV. RESULTS

The following are the results of our implementation.

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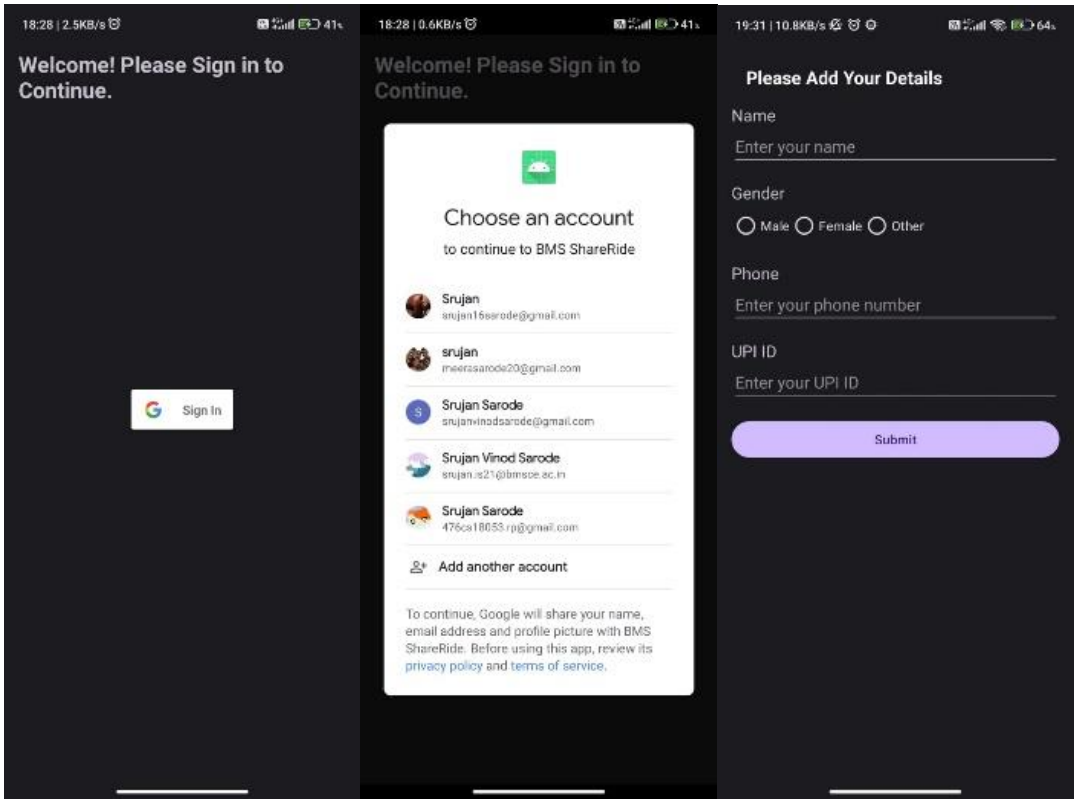

Fig 1: Sign In and Registration pages

Fig 2: Location Selection

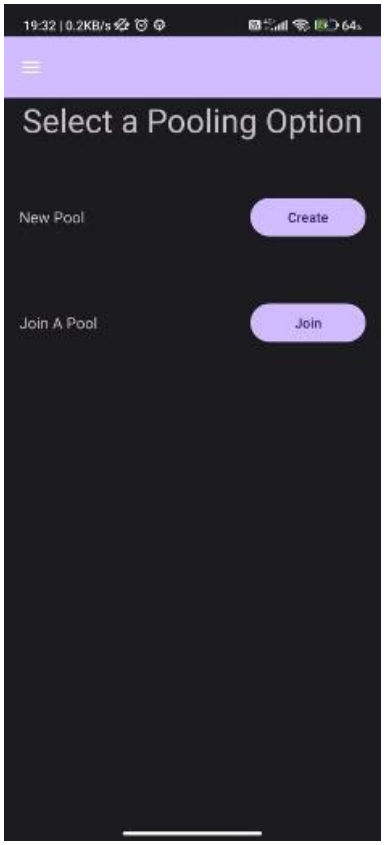

Fig 3: Selection Page

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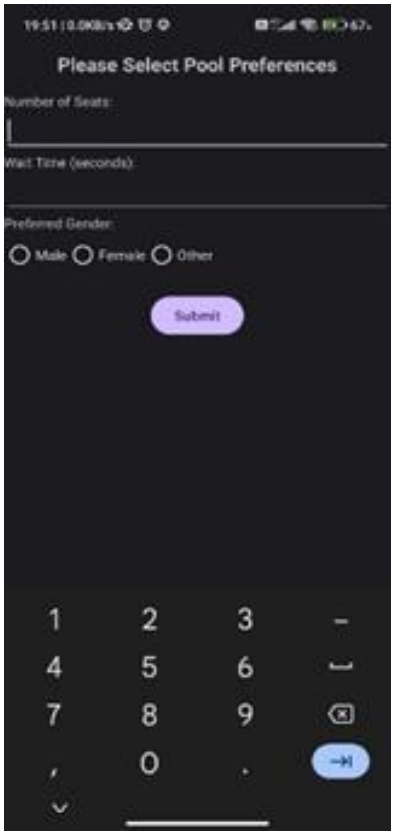

Fig 4: Create Pool,

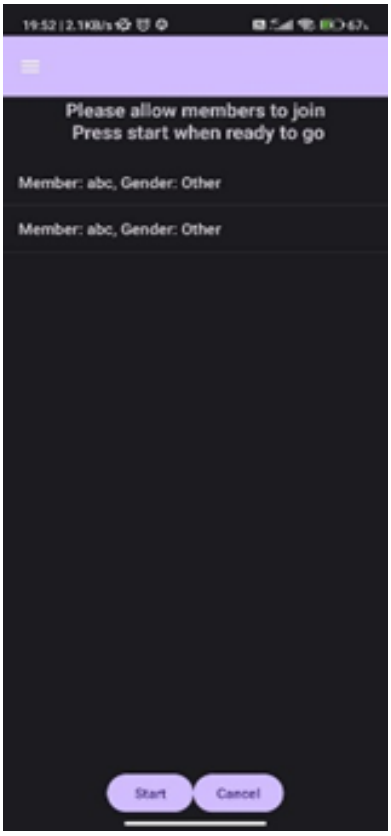

Fig 5: Pool Lobby listing members

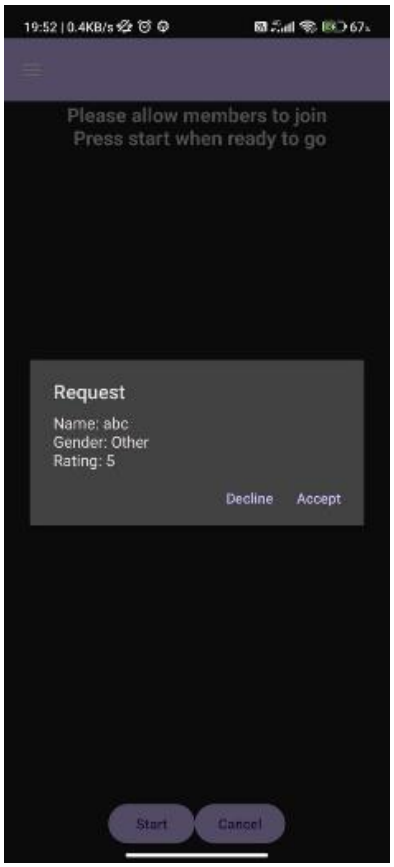

Fig 6: User Requests

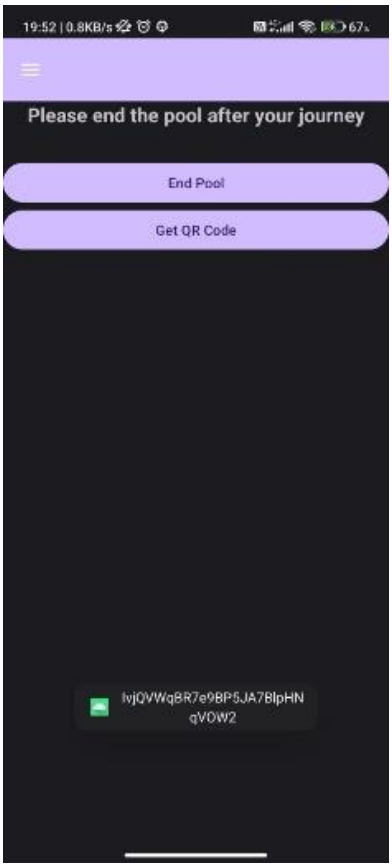

Fig 7: Pool End Screen

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Fig 8: Payment Screen

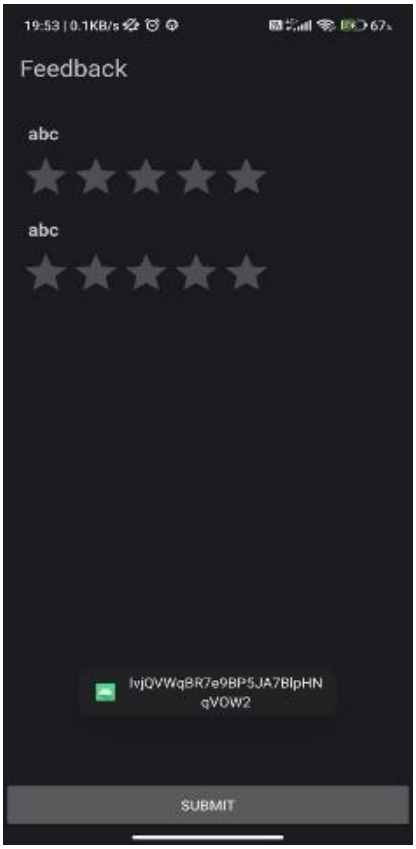

Fig 9: Host Feedback

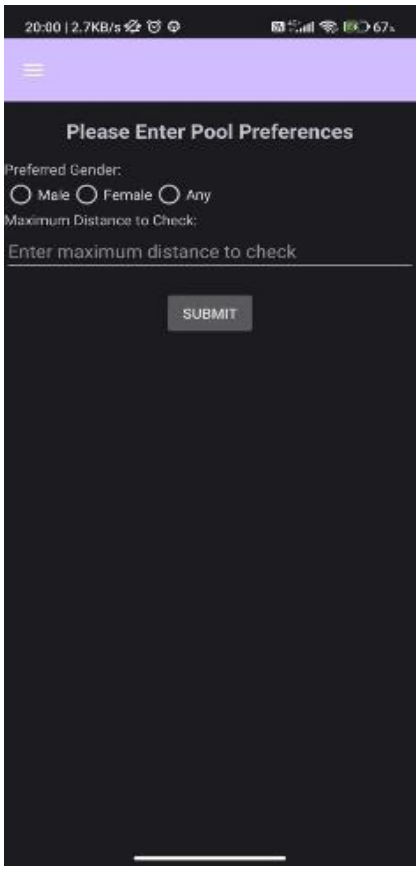

Fig 10: Pool Rider Preference

Fig 11: Pool List

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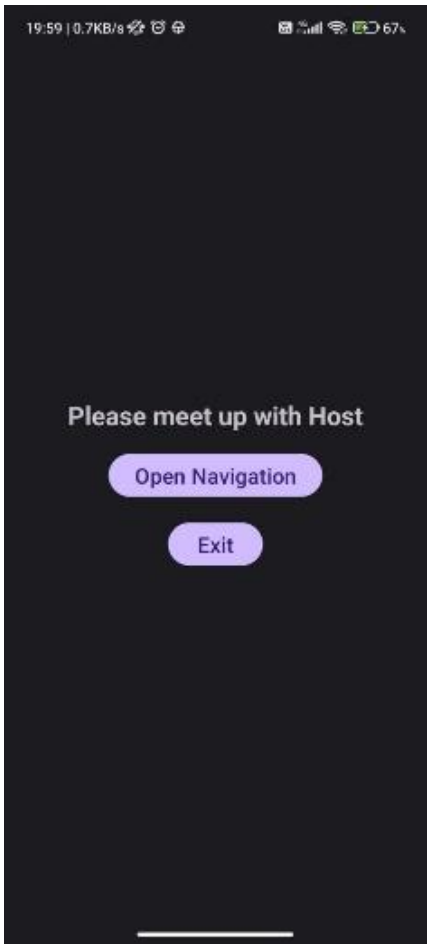

Fig 12: Navigation End

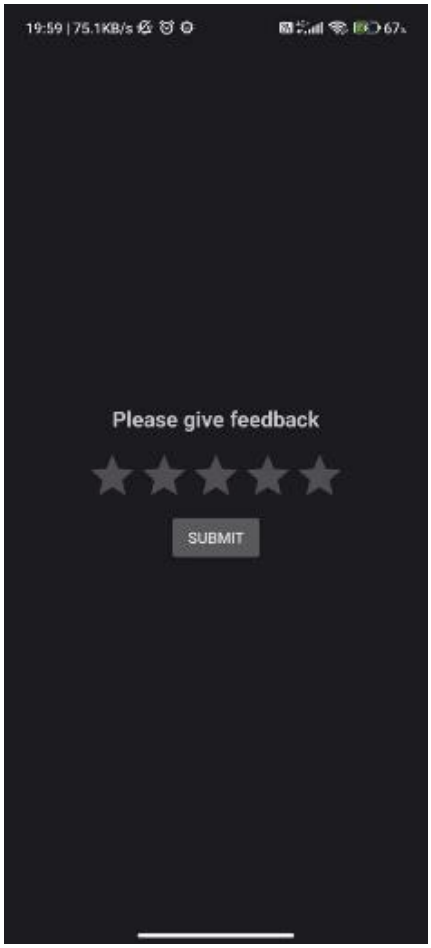

Fig 13: Feedback

V. CONCLUSION

This article successfully implements a ride-pooling app tailored for the BMSCE college community. By leveraging the power of technology, we have provided a convenient, cost-effective, and sustainable transportation solution for students. The app's key features, including pool creation, real-time tracking, payment integration, and feedback system, contribute to enhancing the overall transportation experience within the college. Through user feedback and evaluation, we have determined the app's effectiveness in fostering community connectivity and optimizing resource utilization.

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