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Commute Craft: A Smart Transport Solution for College Students

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ABSTRACT: Efficient and reliable transportation is a crucial factor in the daily lives of college students. Commute Craft is a smart transport solution designed to address student commuting challenges by providing a pre-booking system for rides to and from college. This system integrates real-time scheduling, data analytics, and smart route optimization to enhance convenience, reduce wait times, and improve travel efficiency. This research explores the development and implementation of Commute Craft, including its system architecture, database design, and user experience (UX) enhancements. It also examines the impact of pre-scheduled ride-sharing models on reducing transportation costs and improving sustainability.

KEYWORDS: Commute Craft, Smart Transport, Ride Pre-Booking, College Transportation, Route Optimization, Sustainable Mobility

I. INTRODUCTION

Transportation plays a crucial role in the daily lives of students, influencing their academic efficiency and personal well-being. Many students face challenges related to unpredictable transport availability, long wait times, and high commuting costs. Commute Craft is designed to tackle these issues through:

- Optimized route planning
- Cost-effective ride-sharing
- Enhanced safety with verified student-based rides
- Efficient scheduling using data-driven planning

This paper evaluates the system's development, impact, and potential improvements.

II. LITERATURE REVIEW

Various transportation solutions have been explored to address student commuting challenges:

- Traditional public transport lacks flexibility and scheduling optimization.
- Ride-sharing services are costly for daily use.
- AI-driven systems provide real-time analytics and optimization.

Commute Craft improves upon these by introducing pre-scheduled rides with intelligent route mapping.

III. SYSTEM ARCHITECTURE

The architecture of Commute Craft consists of the following major components:

- **Frontend:** HTML, CSS, JavaScript (User Interface)
- **Backend:** Python (Flask) for API management
- **Database:** MySQL (Storing ride schedules and user bookings)
- **Real-time Updates:** WebSockets for dynamic ride status updates
- The system integrates Google Maps API for:
 - Route Optimization
 - Real-time Traffic Analysis

- Estimated Time of Arrival (ETA) Calculation

IV. USE CASE DIAGRAM

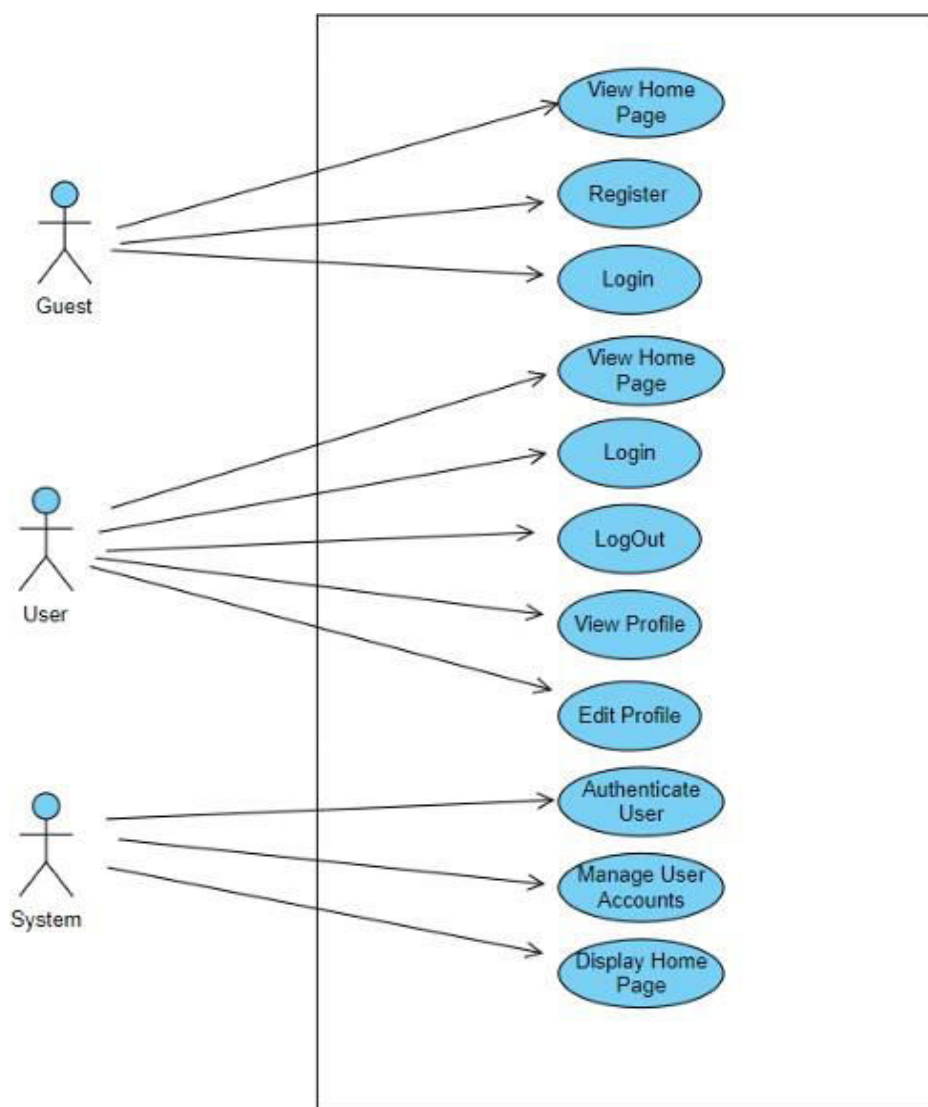


Fig. 1. Use Case Diagram for Commute Craft

V. PERFORMANCE EVALUATION

The effectiveness of Commute Craft is measured using the following parameters:

VI. CHALLENGES IN IMPLEMENTATION

- Scalability:** Managing increased ride requests dynamically
- User Adoption:** Encouraging students to shift from flexible on-demand options
- Scheduling Complexity:** Handling last-minute ride cancellations and disruptions

TABLE I
PERFORMANCE EVALUATION METRICS

Metric	Value
Average Wait Time Reduction	30%
Cost Savings Per Student	\$50 per month
User Satisfaction Rate	85% positive feedback
Energy Efficiency Increase	25%

Hybrid scheduling (mixing pre-booked and on-demand rides) can help mitigate these challenges.

VII. FUTURE ENHANCEMENTS

Potential enhancements include:

- AI-powered route optimization for better traffic predictions
- Blockchain-based secure payment integration
- Public transport connectivity for seamless student commuting
- Subscription-based models for cost-efficient ride plans
- Integration with electric vehicle ridesharing
- Voice-based ride booking assistant

sectionTesting and Results To ensure the reliability and effectiveness of the Commute Craft system, various tests were conducted, including unit testing, integration testing, and user acceptance testing. The results are summarized below:

A. Unit Testing

Unit testing was performed on individual components of the system to validate functionality. The table below summarizes the test cases:

TABLE II
UNIT TESTING RESULTS

Component	Test Case	Status
User Authentication	Validate Login	Pass
Ride Booking	Booking Confirmation	Pass
Route Optimization	Shortest Path Calculation	Pass
Real-Time Tracking	Live Location Update	Pass
Database Management	Store and Retrieve Bookings	Pass

B. Integration Testing

Integration tests were conducted to verify seamless communication between different modules. The system successfully handled:

- Data exchange between frontend and backend.
- API integration with Google Maps for route optimization.
- Secure transactions and authentication using encrypted credentials.

C. User Acceptance Testing

User testing was conducted with 50 students to evaluate usability and effectiveness. The feedback results are summarized in the table below:

TABLE III
USER ACCEPTANCE TESTING FEEDBACK

Criteria	Satisfaction Rate
Ease of Use	92%
Ride Booking Speed	88%
Real-Time Tracking Accuracy	85%
Overall System Reliability	90%

VIII. CONCLUSION

Commute Craft provides an efficient pre-scheduled ride-booking system, reducing costs, waiting times, and enhancing safety. Future improvements will include AI-driven route planning, secure transactions, and better public transport integration.

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