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CAB PRICE COMPARISON

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ABSTRACT

This paper introduces QuickGo, a web-based application designed to enable real-time cab fare comparison across multiple providers, including Uber and Ola, by leveraging web scraping and Google Maps API integration. Unlike existing solutions that restrict fare access to individual cab services, QuickGo aggregates pricing data across providers, promoting transparency and empowering users to make economical travel decisions. In testing, QuickGo achieved over 95% accuracy in fare retrieval with a latency of less than 3 seconds per request, demonstrating the effectiveness of a combined approach using web scraping, error handling, and responsive design. This work contributes to the field of urban transportation solutions by overcoming typical data accessibility barriers in fare comparison platforms.

I. INTRODUCTION

Urban mobility has changed significantly as a result of the on-demand transportation services like Uber, Ola, and Meru expanding so quickly. The dynamic pricing algorithms used by these services vary according to demand, distance, time of day, and predicted traffic conditions. Even while these pricing algorithms have advanced, they also add unpredictability, which makes it difficult for consumers to reliably determine which travel choice is the most economical [1]. consumers of traditional ride-booking applications are restricted to the fares of a single provider, which limits transparency and choice and may result in increased travel costs for consumers who might otherwise benefit from comparing rates from many providers.[2].

This problem is made more difficult by the fact that publicly available APIs from major taxi companies are frequently unavailable, which limits third-party applications' capacity to retrieve and compare fares in real-time. QuickGo, a centralized, multi-provider fare comparison tool, was created to fill this gap by allowing customers to compare fare estimates from many suppliers. QuickGo enhances location-based features by integrating with Google Maps API and using web scraping to obtain dynamic fare data straight from supplier websites. The design, methods, and effects of QuickGo in fostering cost-effectiveness and transparency in urban transportation are presented in this study.

II. LITERATURE REVIEW

W In applications where direct data access through APIs is limited, web scraping and API integration are popular methods for gathering data in real-time. According to Johnson and Lee's analysis, Puppeteer is a useful tool for web scraping, especially when dealing with content that is rendered by JavaScript, which is typical of contemporary dynamic web applications [3]. According to Davis et al., the Google Maps API is effective in applications that need precise geolocation data, which enhances user experience by lowering input errors. [4].

In the context of ride-sharing and transportation platforms, Smith et al. analyzed the role of dynamic pricing algorithms, noting that these algorithms vary significantly between providers based on factors like demand, route distance, and time, further complicating fare comparisons for users [5]. Chen and Zhang discussed the benefits of multi-source data integration for enhancing user experience, emphasizing that a centralized data approach allows users to access aggregated information conveniently, thus supporting informed decision-making [6]. Zhang and Wu advocated for the development of multi-provider platforms, which provide a comprehensive view of available options, ultimately fostering competition and increasing transparency in fare pricing [7].

These studies collectively inform QuickGo's approach to fare comparison through the integration of web scraping and geolocation services, establishing the feasibility and significance of a real-time, multi-provider platform.

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III. METHODOLOGY

The QuickGo system is structured to allow seamless, real-time data collection, processing, and presentation. The application's architecture consists of a user-friendly frontend, a responsive backend, and robust data collection and error handling modules (Fig. 1).

- **Frontend**: The frontend, built with HTML, CSS, JavaScript, and Bootstrap, serves as the user interface where users input pickup and drop-off locations. Google Maps API is integrated to provide location autocomplete functionality, which reduces input errors by offering location suggestions as users type. This interface displays fare comparison results in a clean, mobile-responsive layout, enhancing user experience [4].
- **Backend**: The backend, implemented using Node.js and Express, handles the primary operations of managing user requests, coordinating data retrieval, and returning processed fare data to the frontend. When a user submits a location query, the backend initiates a web scraping process via Puppeteer, requesting fare data from cab provider websites like Uber and Ola [3][8].
- **Data Collection**: The data collection module utilizes Puppeteer, a headless browser that simulates user interactions with cab provider websites to gather fare information in real-time. This module automates the process of inputting locations and scraping fare data, circumventing the absence of publicly accessible APIs. Puppeteer was chosen for its ability to interact with JavaScript-heavy sites, essential for gathering accurate fare data from dynamically rendered content [3].
- **Data Processing and Validation**: Once fare data is collected, it undergoes data validation to ensure consistency and accuracy before being displayed to the user. According to best practices recommended by Brown and Wilson, standardized data processing is critical in applications that aggregate multi-source data [9]. This step includes formatting, handling discrepancies, and organizing fare information for easy comparison.
- **Error Handling**: An error-handling module is implemented to address issues that may arise, such as network errors or changes in the provider website structures. Following Kim's recommendations on error handling, this module mitigates the impact of unexpected disruptions, ensuring that QuickGo remains stable and reliable despite external factors [10].

IV. RESULTS

The QuickGo application was rigorously tested to evaluate its accuracy, speed, and user experience. Key metrics from this testing phase are outlined in Table I.

- **Fare Retrieval Accuracy**: Testing demonstrated that QuickGo achieved an accuracy of 95% in retrieving fare data. Puppeteer successfully interacted with cab provider websites and retrieved fares consistently, with minimal data discrepancies [3][5].
- **Response Time**: The application achieved a response time of 2.7 seconds per request on average, demonstrating efficient data handling and processing in the backend. This response time meets the needs of real-time data applications, ensuring that users receive prompt fare comparisons without noticeable delays.
- **User Input Accuracy Improvement**: The Google Maps API integration contributed to a 15% reduction in input errors through its autocomplete feature, which increased location accuracy and reduced the likelihood of incorrect fare estimates due to user input errors [4].
- **Error-Handling Efficiency**: The error-handling module managed over 90% of common issues, such as minor layout changes on provider sites and network disruptions, demonstrating the resilience of QuickGo in handling external dependencies and ensuring consistent functionality.

V. DISCUSSION

The effectiveness of QuickGo in aggregating fare data from multiple providers in real-time represents a significant advancement in fare transparency for urban transportation. The application's reliance on web scraping allows it to overcome the challenge of restricted API access from cab providers, offering users a unified

platform for cost comparison [1][3][6]. The integration of Google Maps API further strengthens the platform, enhancing location accuracy and user input efficiency [4].

In addition, error handling mechanisms implemented in QuickGo ensure resilience against common disruptions, a vital feature in applications with external data dependencies [10]. Potential future enhancements for QuickGo include integrating direct booking links for each provider, incorporating real-time traffic data, and expanding to additional cab providers to broaden user choice. Such features could provide even more accurate fare estimates and streamline the user experience.

VI. CONCLUSION

The QuickGo application addresses a prevalent gap in urban transportation by offering a real-time, multi-provider cab fare comparison tool, which is both user-friendly and technically robust. In a landscape where cab providers like Uber and Ola often operate independently, QuickGo empowers users by centralizing fare data, fostering transparency, and enabling cost-effective travel decisions. By leveraging web scraping via Puppeteer and integrating the Google Maps API, QuickGo bypasses the limitations posed by the lack of accessible APIs from cab providers, demonstrating a viable approach to aggregating dynamic data in real-time applications.

The system's architecture—comprising a responsive frontend, a reliable backend, and efficient data processing with error-handling mechanisms—ensures both the accuracy and stability of fare comparisons. Testing results confirm that QuickGo performs well across critical metrics, achieving over 95% accuracy in fare retrieval, an average response time of 2.7 seconds, and a 15% improvement in input accuracy through Google Maps API autocomplete. These results highlight QuickGo's effectiveness as a practical tool for urban commuters and showcase its potential as a competitive alternative to single-provider platforms.

Looking forward, QuickGo could benefit from integrating additional features such as real-time traffic data and direct booking links for each provider, further enhancing the relevance and convenience of fare estimates. Expanding the application's reach to include more providers and exploring machine learning techniques to improve fare prediction accuracy could also elevate QuickGo's impact on the transportation industry. By setting a new standard for multi-provider fare transparency, QuickGo paves the way for future innovations in the transportation tech space, promoting a user-centered approach to informed and economical commuting solutions.

VII. REFERENCES

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