Advertisement on Rickshaws: Enhancing Local Business Visibility through Strategic Outdoor Advertising

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Abstract

Adviksha is a geographically optimized rickshaw advertising platform improving localized business outreach through transit advertisement analytics. Unlike conventional static advertising, such as billboards, dynamic targeting, and adaptive optimization of reach can't be cost-efficient. Adviksha overcomes these limitations by means of a distributed digital architecture that combines real-time geo-location tracking with predictive ad analytics and automated campaign management powered by a scalable cloud-based infrastructure. The system architecture includes a Flutter-based frontend, sports back-ends in Dart and JavaScript, and a hybrid MySQL-Firebase database built for high-volume data management and storage scalability. Real-time rickshaw tracking through the Ola Maps API allows for the dynamic placement of ads by traffic flow and consumer density analytics. A secure transaction model implemented through the Razorpay API ensures financial integrity in revenue sharing between the advertisers and rickshaw operators. Computation-style analytics are used to quantify advertising impact, measuring ad impressions, geo-fenced exposure, and conversion probabilities that help in budget optimization by cost-per-impression (CPI) modeling. Ad verification is performed using image recognition and GPS validation protocols. Identified challenges are handled through asynchronous caching, TLS-encrypted API endpoints, and heuristic-based anomaly detection algorithms, which counter GPS signal reliability issues, latency in real-time ad validation, and large-scale data synchronization problems, thus preserving data integrity and further enhancing the network's resilience under high-density urban conditions.

Keywords: Rickshaw-Based Advertising, Geospatial AdTech, Transit Advertising Analytics, Automated Campaign Optimization, Cost-per-impression (CPI) modeling, GPS signal, Firebase hybrid database, Dart, JavaScript, TLSencrypted API

1. INTRODUCTION

The innovation is changing the face of advertising with many organizations coming forward to create resource-effective and innovative approaches to reach target audiences. While traditional advertising still holds its importance, the exorbitant cost and limited engagement push an organization toward more dynamic and localized alternatives. One such example is the rickshaw advertising, which uses the route of getting trapped from all urban high-traffic roads for visibility and consumer outreach.

In this research, a data-driven rickshaw advertising platform connects advertisers and rickshaw owners

through a web-based interface. The system works as an intermediary while creating a structured database that simplifies the ad placements and campaign executions. It provides cost-effective hyperlocal marketing solutions for organizations, thereby creating other revenue streams for rickshaw operators.

The study looks at system-development, encompassing literature on the effectiveness of transit advertising. The methodology includes the research design, data acquisition, and analysis involving key perspectives from the advertisers and rickshaw owners. The survey-based findings validated the effectiveness of the platform, followed by a discourse on its implication in advertising economics. By combining mobility with geospatial targeting, it changes the rules of the game for traditional advertising, providing a scalable tech-enabled solution to local brand engagement.

1.1. Background and Motivation

Traditional advertising is expensive and lacks dynamic targeting. Businesses are looking for innovative and cost-effective data-driven measures. Rickshaw-based urban mobility maximizes high visibility and engagement through geospatial tracking and analytics.

1.2. Problem Statement

Existing outdoor advertising is not capable of real-time targeting, efficiency in cost, and adaptability to the audience. The static billboard mechanism has a reach limited outlay, while digital alternatives are comparatively costly. A technology-addressed rickshaw advertising platform solves these inefficiencies.

1.3. Objective of the Study

This research develops Adviksha, a scalable, AI-powered advertising platform optimizing rickshaw-based ads. It ensures dynamic ad placement, automated analytics, secure transactions, and economic benefits to businesses, rickshaw owners, and advertisers.

2. METHOD

The proposed rickshaw-based advertising platform integrates geospatial tracking, predictive analytics, and automated campaign management to optimize ad placement and target audiences. A system architecture built as a Flutter-based front-end to facilitate cross-platform access, a backend focused on processors written in both Dart and JavaScript, and a hybrid database comprising MySQL and Firebase are employed for efficient real-time data synchronization and scalability.

2.1. System Implementation

The platform relies on the Ola Maps API for real-time rickshaw tracking so that ad placements may be adjusted dynamically based on traffic density and consumer hotspots. This Razor pay API integration facilitates secure financial transactions between advertisers and rickshaw owners. An automated ad verification module utilizes image recognition and GPS validation algorithms to check ad compliance.

2.2. Data Processing and Analytics

A cost-per-impression (CPI) modeling approach is implemented to assess the ad's effectiveness. The system will record ad impressions, geo-fenced exposures, and conversion probabilities, which will allow predictive analytics for advertising budget optimization.

2.3 Security and Optimization

The way of doing asynchronous data caching, TLS-encrypted API endpoints, and edge computing techniques is meant to resolve the inconsistency and latency of GPS signals while validating ads. Thus, these methods will support the security, high throughput data transmission, and network resilience within the highly populated city areas.

2.4 Abbreviations and Acronyms

Sr No.	Abbriviation	Full Form
1	SMB	Small and Medium Businesses
2	UI	User Interface
3	API	Application Programming Interface
4	GPS	Global Positioning System
5	DB	Database
6	CRUD	Create, Read, Update, Delete
7	SSL	Secure Sockets Layer
8	SQL	Structured Query Language

3. RESULTS AND DISCUSSION

3.1 Results

Adviksha improved local business engagement and reduced advertising costs while increasing rickshaw owners' income. The system achieved high accuracy in ad verification, mitigating GPS inconsistencies for real-time ad updates using asynchronous caching and TLS encryption.

3.2 Discussion

These results prove that rickshaw-based advertising is an affordable and scalable substitute for old methods. The campaign efficiency gets a boost with all this by integrating geospatial tracking and predictive analytics with automatic targeting. Optimization techniques enhanced the system reliability and advertising verification despite minor GPS inaccuracies. The dual potentiality of the platform increases advertisement revenue and advertisement usability for advertisers and rickshaw owners, respectively. The new provision may include AI-generated ad placements and blockchain-based revenue tracking, bringing more transparency, security, and performance, thus fortifying Adviksha's place in urban transit advertisements and digital marketing.

CONCLUSION

This work investigates the use of rickshaw advertising, geospatial and automated campaign management, for a cost-effective and scalable alternative to outdoor advertising. The Adviksha platform improves advertiser reach, cost-per-impression optimization, and provides ad revenue to the rickshaw owners. Using real-time tracking and predictive analytics with secure transaction mechanisms enables efficient and transparent placement of advertisments. With some minor uncertainties such as GPS inaccuracies, these optimizations ultimately allow for improved reliability. AI targeting ads and blockchain revenue tracking-on-thought might still further optimize target performance. This study therefore establishes rickshaw advertising in itself as a techno-commercial avenue to viable urban marketing.

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