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LOCATE MY LOCAL: A GEOSPATIAL WEB-BASED FRAMEWORK FOR ENHANCING THE DIGITAL VISIBILITY OF STREET VENDORS IN CHENNAI

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ABSTRACT

The informal economy, specifically street vending, serves as a vital pillar of urban subsistence in developing nations. However, these vendors often suffer from a lack of digital presence, which limits their market reach in an increasingly tech-centric society. This paper introduces "Locate My Local," a geospatial web portal designed to provide real-time location visibility for street vendors using Stadia Maps and Leaflet.js. By leveraging HTML5 Geolocation and a responsive JavaScript-driven frontend, the portal enables vendors to broadcast their coordinates dynamically. Our research explores the system architecture, the integration of mapping APIs, and the socio-economic implications of digitizing informal trade. Results demonstrate that the platform maintains high technical performance under concurrent loads, offering a scalable solution for urban digital inclusion.

KEYWORDS: Stadia Maps, Leaflet.js, Geolocation, Street Vendors, Web Architecture, Digital Inclusion, Chennai, Urban Informatics.

I. INTRODUCTION

In the contemporary digital era, the visibility of a business is often equated with its existence. While multinational corporations and established retail outlets leverage complex Global Positioning Systems (GPS) and Search Engine Optimization (SEO) to maintain a constant digital presence, the informal sector remains significantly marginalized.

Street vendors, who provide essential goods and services directly to urban populations, operate largely in a "digital shadow." Their mobile nature, while a strategic advantage for reaching customers physically, becomes a hindrance in a digital-first economy where consumers prefer to locate services via their smartphones.

Chennai, a bustling metropolitan hub, hosts thousands of street vendors selling everything from fresh agricultural produce to artisanal crafts. These vendors are critical to the city's food security and economic resilience. However, the unpredictability of their locations leads to missed opportunities. A customer looking for a specific seasonal fruit or a local weaver may spend significant time searching physical streets without success. The "Locate My Local" project was conceived to solve this specific information asymmetry. By providing a lightweight, browser-based portal, we empower these vendors to have a "digital storefront" that moves with them.

The technical core of this project relies on accessible web technologies. Unlike heavy native applications that require high processing power and significant data storage, our portal uses a "MERN-Lite" approach. We utilize HTML5 for structural integrity, CSS3 for responsive visuals, and JavaScript for the complex logic required to interface with the Stadia Maps API. Stadia Maps was specifically chosen over more traditional providers due to its focus on performance and privacy, as well as its visually clean tile sets which are essential for navigating the dense urban geography of Pallavaram and surrounding Chennai districts.

II. LITERATURE REVIEW

The digitization of the informal economy has been a subject of intense academic debate. Vygotsky's theories on social interaction suggest that tools (in this case, digital ones) can fundamentally change how humans interact with their environment. In the context of street vending, a mapping tool acts as a "mediator" that bridges the gap between a mobile provider and a stationary consumer. Previous studies on Learning Management Systems (LMS) and collaborative portals, such as the "Study Hub" model, emphasize that centralized digital infrastructure improves conceptual engagement. We apply this logic to the commercial sector, where a centralized portal for vendors improves market engagement.

Mapping technologies have evolved from static images to dynamic, interactive experiences. The advent of Leaflet.js has democratized the creation of mobile-friendly maps. Research by Nielsen on usability engineering suggests that for a tool to be successful in an informal setting, it must have a near-zero learning curve. Our literature review indicates that most existing commercial maps are "instructor-centric" or "business-centric," requiring fixed addresses. By utilizing the HTML5 Geolocation API, "Locate My Local" shifts the focus to "user-centric" and "vendor-centric" mapping, which is essential for the mobile nature of street trade.

III. TECHNICAL FRAMEWORK: HTML, CSS, AND JAVASCRIPT INTEGRATION

The "Locate My Local" portal is built upon the fundamental pillars of web development. To ensure the application is accessible on diverse devices, ranging from budget smartphones to high-end tablets, we have leveraged the unique strengths of HTML5, CSS3, and JavaScript (ES6+).

A. STRUCTURAL FOUNDATION WITH HTML5

HTML5 provides the semantic structure of our application. We have utilized specific tags to ensure accessibility and SEO-friendliness. The map interface is contained within a dedicated , while vendor profiles are structured using <article> and <section> tags. To facilitate vendor updates, we implemented an optimized <form> that utilizes HTML5 input types for efficient data entry. This structural clarity allows for easy maintenance and future integration with secondary services.

B. VISUAL OPTIMIZATION WITH CSS3

The visual identity and responsiveness of the portal are governed by CSS3. Given the varied screen sizes in our target user base, we utilized Flexbox and CSS Grid to create a truly fluid layout. Furthermore, custom media queries ensure that the UI adapts seamlessly between portrait and landscape modes. To enhance the user experience, we implemented CSS3 transitions and animations, providing visual feedback when a vendor updates their status or when a customer hovers over a map marker. Special attention was paid to the Z-index management to ensure that popups and control buttons always remain accessible over the map tiles. We also utilized CSS variables for color schemes, allowing for easy "Dark Mode" implementation in future updates to reduce eye strain during evening market hours.

C. DYNAMIC LOGIC WITH JAVASCRIPT (ES6+)

JavaScript acts as the engine of our application. It orchestrates the communication between the user's browser, the geolocation hardware, and the Stadia Maps API. We utilized modern ES6 features such as Arrow Functions, Template Literals, and Promises to maintain a clean and efficient codebase. The core logic involves a continuous loop that monitors the vendor's GPS coordinates and broadcasts updates to the central database using asynchronous Fetch API requests. This asynchronous approach ensures that the map remains interactive and does not "freeze" while data is being transmitted. Furthermore, we implemented client-side data validation using JavaScript to ensure that coordinate data is accurate before it is sent to the server.

IV. SYSTEM ARCHITECTURE

The architecture of the "Locate My Local" portal is designed for maximum efficiency and minimum latency. We employ a Three-Tier Client-Server model that separates the user interface from the logic and data storage components.

A. PRESENTATION LAYER

The presentation layer is the primary interface for both vendors and customers. It is designed using a mobile-first philosophy. Given that most vendors in Chennai utilize mid-to-low range Android devices, the CSS3 framework is optimized to prevent heavy rendering loads. The interface includes a high-contrast map view, a search bar for filtering categories, and a "Broadcast My Location" toggle for the vendors.

B. APPLICATION LOGIC LAYER

This layer is the "brain" of the portal. Written in JavaScript (ES6+), it handles the following critical functions:
1. Coordinate Acquisition: Using navigator.geolocation.getCurrentPosition() to fetch precise GPS data.
2. API Integration: Fetching vector tiles from the Stadia Maps server via secure HTTPS requests.
3. Marker Management: Logic to determine which icon to display based on the vendor's chosen category (Food, Textiles, Services).

V. METHODOLOGY

Our development process followed the Agile Scrum framework, spanning a 12-week development cycle at VISTAS. The methodology was divided into three distinct phases to ensure that the final product was both technically sound and socially relevant.

A. REQUIREMENT GATHERING

We conducted field surveys in the Pallavaram market area. We interviewed 30 street vendors to understand their technological literacy and their willingness to share their location data. The results showed a 90% positive interest rate, provided the interface was simple to use. Customers were also surveyed, revealing that "lack of certainty" was

the primary reason they chose supermarkets over street vendors. This confirmed the need for a real-time tracking solution.

B. SPRINT CYCLES

The implementation was broken down into two-week sprints:

- Sprint 1: UI/UX design and Stadia Maps tile layer integration.
- Sprint 2: Geolocation API implementation and accuracy testing in various weather conditions.
- Sprint 3: Category filtering and database schema design for vendor profiles.
- Sprint 4: Stress testing the API response times and refining the CSS for cross-browser compatibility.

VI. IMPLEMENTATION DETAIL

The implementation phase focused on the seamless integration of the mapping engine with the frontend logic. We utilized Stadia Maps' 'Alidade Smooth' theme, which provides a high level of detail for street names while keeping the background neutral enough for markers to stand out. This is particularly important for the complex street layouts of Chennai.

One of the unique challenges during implementation was handling "GPS drift." In dense urban environments, signals can bounce off buildings. To solve this, we implemented a Kalman filter logic within the JavaScript layer to smooth out the movement of the vendor markers, ensuring that the customer sees a steady path rather than a jumping icon.

VII. RESULTS AND DISCUSSION

The performance of the "Locate My Local" portal was measured against industry standards for interactive web applications. We utilized Apache JMeter to simulate concurrent users accessing the map in a small geographic radius (Pallavaram district).

As shown in our performance testing, the system maintains exceptional response times even as the number of concurrent users increases. This is largely due to the optimized tile-serving architecture of Stadia Maps and our efficient marker-rendering logic. All response times remained below the 300 ms threshold, which is the gold standard for user interface responsiveness. Furthermore, usability scores from our 30-participant test group averaged 82.4 on the System Usability Scale (SUS), placing the application in the "Excellent" category. Participants noted that the map theme was particularly easy to read under direct sunlight—a common scenario for street vendors.

VIII. ADVANTAGES AND LIMITATIONS

The "Locate My Local" portal offers a paradigm shift in how we view informal commerce. By providing a digital bridge, we enhance local economic resilience and promote sustainable shopping habits.

A. ADVANTAGES

- Economic Empowerment: Provides small-scale entrepreneurs with visibility previously reserved for large corporations.
- Urban Efficiency: Reduces the "search time" for consumers, leading to more efficient shopping trips and lower carbon footprints.
- Low Entry Barrier: Requires no specialized equipment—only a standard smartphone browser is needed.

B. LIMITATIONS

- Data Dependency: The system requires an active data connection, which may be a hurdle in some low-income neighborhoods.

- GPS Accuracy: Environmental factors like high-rise buildings can still cause minor inaccuracies in location broadcasting.

IX. FUTURE WORK

While the current prototype is fully functional, we plan to extend the capabilities of "Locate My Local" in the following ways: we will implement Natural Language Processing (NLP) to support regional languages, specifically Tamil. This will allow vendors to update their status via voice commands or Tamil text, significantly improving accessibility. Second, we aim to integrate an Offline Map Mode using Service Workers, allowing customers to view the last known locations of vendors even without an active internet connection. Finally, we are exploring the use of Machine Learning to predict vendor movement patterns, providing customers with "estimated arrival times" for their favorite vendors.

X. CONCLUSION

This paper has documented the development and evaluation of the "Locate My Local" geospatial portal. By combining modern web technologies with the specific needs of the street-vending community in Chennai, we have demonstrated that digital tools can be used to foster inclusion rather than just competition. The technical success of the platform, evidenced by sub-300 ms latencies and high usability scores, suggests that a full-scale deployment could significantly impact the local economy. As urban centers continue to digitize, it is imperative that the informal sector is not left behind. This project serves as a foundational step toward a more equitable and visible urban marketplace.

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