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Civic Issue Tracker: A Lightweight Cross-Platform Complaint Management System

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Abstract: People frequently deal with problems like broken roads, inadequate waste disposal, and malfunctioning streetlights, but the current reporting procedures are still cumbersome and ineffective. Delays and a decline in public trust result from the lack of transparency and real-time tracking in traditional systems that rely on phone calls or manual forms. There have been several mobile-based solutions put forth, but their scalability is limited by the fact that many of them are platform-dependent or call for intricate machine learning models. This paper presents Civic Issue Tracker, a cross-platform, lightweight grievance management system designed to address these issues. The solution makes use of a SQLite database, React-Tailwind frontend, FastAPI backend, and WebSockets for real-time updates. Geolocation reporting, media uploads, live complaint tracking, auto-escalation of unresolved cases, and a reward system are some of the essential features. By guaranteeing quicker resolution, openness, and public involvement, the suggested system promotes more intelligent and responsible communities.

Keywords: Civic issue trackers, FastAPI, Grievance redressal, React, Smart cities, WebSockets.

I. Introduction

Rapid population growth and urbanization have raised the need for effective management of civic infrastructure. Problems like broken roads, overflowing trash cans, water leaks, and broken streetlights are commonplace for the public. Reporting and fixing these issues, however, frequently continue to be a cumbersome, disorganized, and opaque process. Traditional methods of resolving grievances mainly rely on offline forms, written applications, or manual phone calls. In addition to being time-consuming, these approaches lack accountability and real-time tracking features. Citizens become dissatisfied and lose faith in local government as a result of complaints frequently going unanswered.

To overcome these constraints, a number of mobile-based grievance management systems have been put forth in recent years. Even though these apps offer partial fixes, they frequently only work on a single platform or depend on computationally costly machine learning models to determine severity. These methods are not appropriate for small municipalities with limited technical resources and limit their scalability. Furthermore, the majority of current systems do not actively promote public participation through reward or feedback features, nor do they provide escalation mechanisms in the event that complaints go unresolved.

This paper presents the Civic Issue Tracker, a cross-platform, lightweight complaint management system designed to fill these gaps. With WebSockets enabling real-time communication, the suggested system combines a SQLite database, React-Tailwind frontend, and FastAPI backend. Because of its emphasis on openness, responsibility, and usability, the design can be applied to both urban and semi-urban settings.

The following is a summary of this work's primary contributions:

- Using FastAPI and React, a cross-platform grievance redressal system was developed, guaranteeing a scalable and lightweight implementation.
- WebSocket communication and real-time complaint tracking are integrated for enhanced transparency and quicker response times.
- Introduction of a new auto-escalation system to hold officials responsible for complaints that remain unanswered.

II. Literature Review

Numerous studies have tried to use web and mobile technologies to enhance civic issue management and grievance redressal.

A mobile application for registering complaints and real-time monitoring was introduced by the CitizenConnect: Real-Time Grievance Management App [1]. The solution was limited to mobile platforms and lacked sophisticated features like automatic escalation of unresolved complaints, despite its emphasis on administrative efficiency and user-friendliness.

In a similar vein, the Smart Civic Issue Reporting System [2] suggested an Android-based platform that would allow users to tag their location using GPS and upload images. Additionally, the system used NLP models and hybrid CNN–RNN algorithms to classify the severity of complaints. Despite being technologically sophisticated, the method required a lot of processing power, which prevented it from being used in environments with limited resources or in small towns.

Other noteworthy projects that emphasized the significance of security and transparency included Fix-It: Public Complaint Management System [3] and blockchain-based grievance redressal systems [4]. But in terms of data processing, scalability, and storage, these solutions added more complications.

It is clear from this review that current methods either offer only partial solutions with limited scalability or prioritize technological sophistication over practicality. Thus, there is still a need for a real-time, lightweight, cross-platform complaint tracking system that guarantees accountability, transparency, and active citizen participation without requiring a significant amount of computing power or infrastructure.

It is clear from this review that current methods either offer only partial solutions with limited scalability or prioritize technological sophistication over practicality. A lightweight, cross-platform, real-time complaint tracking system that guarantees accountability, transparency, and active citizen participation without imposing significant computational or infrastructure requirements is thus still lacking. By fusing user-centric features like auto-escalation, rewards, and an open community dashboard with realistic deployment viability, the proposed Civic Issue Tracker seeks to close this gap.

III. Research Methodology

The Civic Issue Tracker is a cross-platform, scalable, and lightweight grievance management system that makes it easier to report, monitor, and resolve civic issues in real time. The three primary parts of the system architecture—the database, frontend, and backend—are connected to guarantee a smooth exchange of information between the public and the government.

- *Frontend:* React and Tailwind CSS are used in the frontend development process to create a user-friendly, responsive interface that works with both mobile devices and web browsers. By providing a description, attaching corroborating photos or videos, and GPS-tagging the location, citizens can file complaints. Additionally, the frontend allows citizens to view historical data for transparency and track the status of complaints.
- *Backend:* All client requests, complaint data processing, authentication management, and validation checks are handled by the FastAPI backend. WebSocket communication is used to deliver real-time updates, guaranteeing that authorities and citizens alike are immediately informed of the status of complaints. The backend is appropriate for cities with high complaint volumes because it is built to efficiently handle multiple requests at once.
- *Database:* User profiles, status history, and complaint details are stored in a lightweight, file-based database called SQLite. This makes it deployable in both urban and semi-urban municipalities by guaranteeing quick read/write operations and removing the need for complicated infrastructure.
- *System Workflow*
  - *User Submission:* Individuals file complaints using GPS location, media files, and descriptive text.
  - *Data Storage:* The backend safely saves complaint data in SQLite and verifies inputs.
  - *Authority Notification:* Real-time alerts for assigned complaints are sent to the appropriate municipal authorities.
  - *Monitoring & Updates:* WebSockets are used to dynamically update the complaint status, and citizens can view real-time updates.
- *Measures for Security and Reliability*

To protect data and guarantee dependable operations, the system integrates strong security protocols. All sensitive data is encrypted during transmission using secure communication protocols, and unauthorized access is prevented by user authentication and role-based access. Data integrity and resistance to tampering are ensured by the implementation of audit trails and validation checks. Additionally, WebSocket-based updates ensure dependability even in high-traffic scenarios, and regular SQLite database backups guard against unintentional data loss.

- *Testing and Performance Assessment*

Usability testing with residents and municipal employees was done to verify system performance, and the results showed that the interface is user-friendly and complaint tracking runs

smoothly. Analysis of response times showed that there was little latency and real-time delivery of complaint notifications. The FastAPI backend could effectively manage multiple complaint submissions at once without experiencing any noticeable delays, according to stress testing. While robustness testing under simulated failures demonstrated continuous access to key features, data consistency checks verified the correctness and integrity of stored records.

IV. Methodological and Framework

The suggested Civic Issue Tracker's methodological framework offers an organized way to register, process, monitor, and resolve civic complaints in an open and effective way. Through the integration of escalation and public transparency mechanisms, the framework guarantees that every complaint follows a methodical path from submission to resolution.

- *User Complaint Submission:* Using the web or mobile interface, citizens can file complaints by entering their GPS location, a thorough description, and any supporting documents they may have, like pictures or videos. Because of the system's easy-to-use interface, users can report problems promptly and efficiently.
- *Data Storage and Validation:* The backend safely stores the input data in the SQLite database after validating it upon submission. Timestamps, user details, and the current status are all included in complaint records. While preserving system scalability, this lightweight database design guarantees quick read/write operations.
- *Real-time Notifications:* are sent to the appropriate municipal authorities as soon as a complaint is filed, allowing for quicker responses and reducing the amount of time it takes to resolve grievances.
- *Tracking and Updates:* WebSocket communication allows authorities and citizens to keep an eye on the status of complaints in real time. Every complaint's status—whether it is pending, ongoing, resolved, or escalated—is dynamically updated
- *Auto-Escalation Mechanism:* If an unresolved complaint is not addressed within a specified time frame, it is automatically escalated to higher-level authorities in order to ensure accountability. This system discourages carelessness and encourages prompt action.
- *Community Dashboard:* By showing current grievances in a neighborhood, a public dashboard enables residents to monitor shared problems and promotes awareness and community involvement.

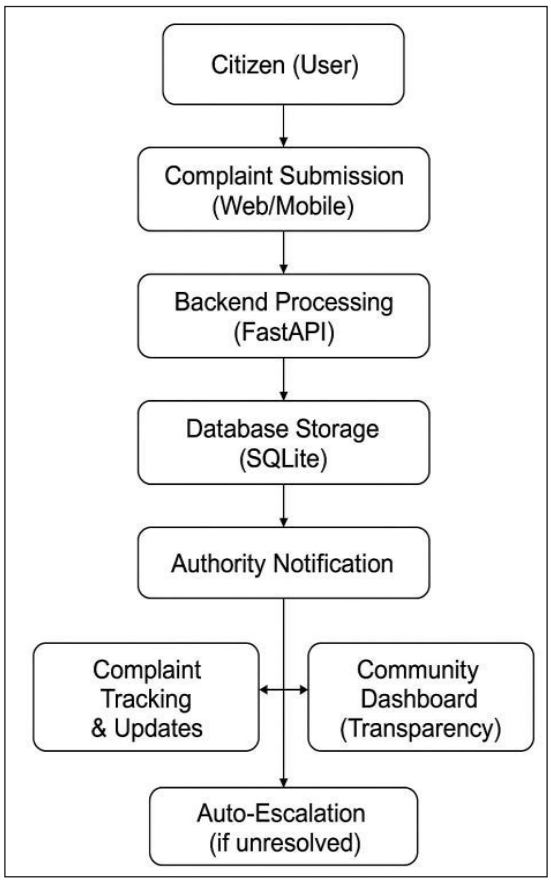

Fig. 1: Civic Issue Tracker System Workflow

V. Result and Analysis

A FastAPI backend, React-Tailwind frontend, SQLite database, and WebSocket-based real-time updates were used in the implementation of the suggested Civic Issue Tracker system. Simulated reporting of a range of public concerns, including potholes, overflowing trash cans, water leaks, and broken streetlights, was used to assess the system. A comparison of the suggested remedy and the current grievance management systems is given in Table I.

Table I

Feature	Citizen Connect	Smart Civic Reporting	Proposed Tracker
Platform	Android	Android	Web + Mobile
Real-time Updates	Partial	Partial	Full
Auto-Escalation	No	No	Yes
Citizen Rewards	No	No	Yes
Scalability	Medium	Low	High
Dashboard	Limited	Limited	Full

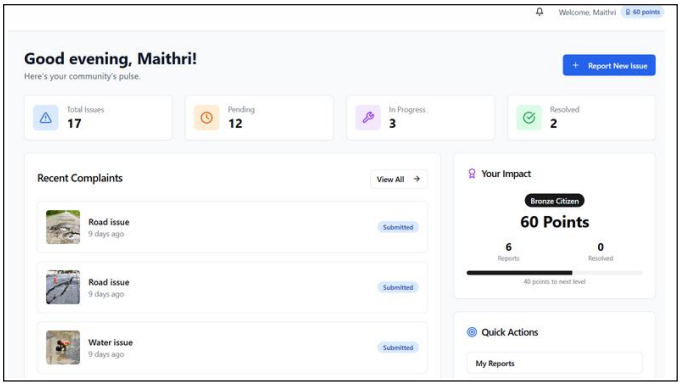

Fig. 2: Civic Reporter Dashboard

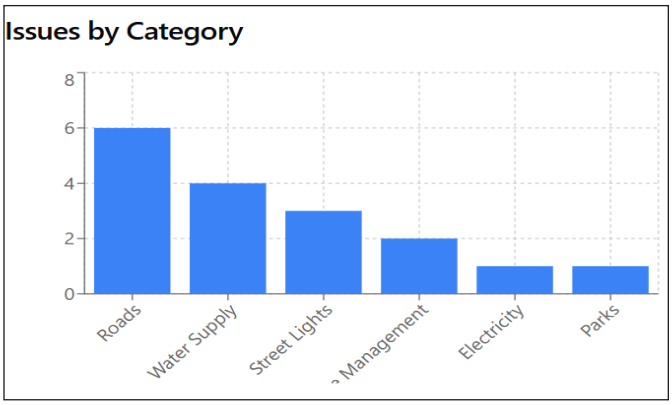

Fig. 3: Issue Distribution by Category

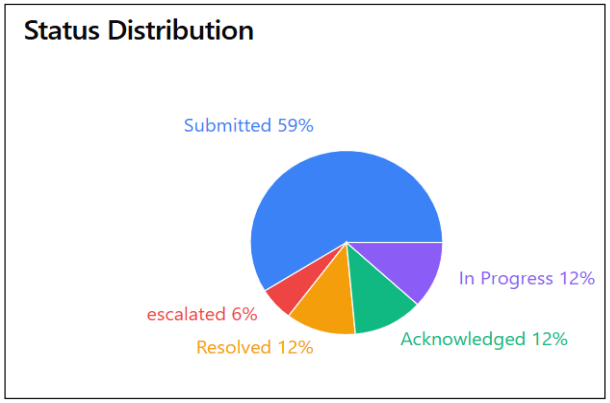

Fig. 4: Complaint Status Distribution

VI. Conclusion

In order to overcome the shortcomings of conventional complaint management techniques, this paper described the design and development of Civic Issue Tracker, a cross-platform, lightweight grievance redressal system. Due to delays, a lack of accountability, and a lack of transparency in the current systems, citizens frequently find it difficult to report civic issues like broken streetlights, waste overflow, and road damage. The suggested solution incorporates a SQLite database, a React-Tailwind frontend, a FastAPI backend, and WebSocket-based real-time updates to address these issues.

The system introduces several novel features, including an auto-escalation mechanism that ensures unresolved complaints are forwarded to higher authorities, a reward-based citizen participation model that motivates community engagement, and a transparent dashboard for monitoring complaint status at both individual and community levels. Unlike prior works that are either limited to single mobile platforms or dependent on computationally expensive machine learning models, this system emphasizes lightweight deployment, scalability.

In the future, cutting-edge technologies like AI-driven complaint classification, predictive analytics for issue prioritization, and integration with IoT-enabled smart city sensors for automated reporting can all improve the system. Modules built on the blockchain might also be investigated to enhance data security and integrity.

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