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UrbanEye: An Intelligent Eye For A Smarter City

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Abstract - *Rapid urbanization has led to an increase in civic issues such as potholes, waste accumulation, and infrastructure damage, which significantly affect the quality of urban life. Traditional complaint management systems are often inefficient, lack real-time tracking, and require manual intervention. To address these challenges, this paper presents* ***UrbanEye****, an AI-powered urban issue mapping system that enables citizens to report and monitor civic problems through a mobile application.*

The proposed system is developed using React Native for the frontend and Supabase for backend services, ensuring scalability and real-time data management. Users can report issues by uploading images, selecting categories, and providing location details, which are then processed and displayed on an interactive map. The system also includes features such as notifications, news updates, and a voucher- based reward mechanism to enhance user engagement. Additionally, an admin dashboard is provided for efficient monitoring and resolution of reported issues.

The results demonstrate that the system improves the efficiency of urban issue reporting and enhances communication between citizens and authorities. The integration of modern technologies such as cloud computing and optional AI-based classification makes UrbanEye a scalable and effective solution for smart city management.

Key Words: **Smart City, CivicTech, Urban Issue Mapping, React Native, Supabase, Cloud Computing, GIS, Mobile Application, AI, Issue Reporting**

1. INTRODUCTION

The Rapid urbanization has led to a significant increase in civic issues such as potholes, uncollected garbage, broken streetlights, and damaged infrastructure.[1][4] These problems directly affect the quality of life of citizens and require timely identification and resolution. However, existing complaint systems are often inefficient, lack real-time tracking, and involve manual processes that delay action.[1][2]

With the advancement of smart city technologies and mobile computing, there is a growing need for an intelligent, user-friendly, and real-time urban issue reporting system. In this context, UrbanEye is proposed as an AI-powered civic issue mapper that enables citizens to report urban problems using a mobile application. The system allows users to capture images of issues, which are then analyzed using artificial intelligence to automatically categorize and describe the problem.[3]
UrbanEye integrates modern technologies such as React Native for mobile development, Supabase for backend services including authentication, database, and storage, and AI models for image-based analysis. Additionally, it provides
a real-time administrative dashboard for authorities to monitor, manage, and resolve reported issues efficiently.
The primary objective of this system is to bridge the gap between citizens and municipal authorities by providing a transparent, efficient, and scalable platform for urban issue management. By leveraging AI and real-time data, UrbanEye contributes towards building smarter, cleaner, and more responsive cities.

2. LITERATURE SURVEY

Several research works and existing systems have attempted to address urban issue reporting and smart city management using digital platforms. This section reviews relevant studies and highlights their limitations, which motivated the development of UrbanEye.

2.1 Smart City Complaint Management Systems

Existing government-based complaint systems such as municipal portals and mobile applications allow users to register complaints regarding civic issues. These systems provide basic functionalities like complaint submission and status tracking. However, they often lack real-time responsiveness, intuitive user interfaces, and intelligent categorization of issues. Additionally, many systems depend heavily on manual data entry, which reduces efficiency and accuracy.[1][2]

2.2 GIS-Based Urban Monitoring Systems

Geographic Information System (GIS) based solutions have been widely used for mapping and monitoring urban infrastructure. These systems help authorities visualize issues geographically and plan resource allocation. However, most GIS-based systems are complex, require expert handling, and are not directly accessible to common citizens for real-time issue reporting.[4]

2.3 AI-Based Image Recognition for Civic Issues

Recent research has explored the use of artificial intelligence and computer vision techniques for detecting urban problems such as potholes, garbage accumulation, and road damage. Convolutional Neural Networks (CNNs) and deep learning models have shown promising results in automated classification.[3] Despite their effectiveness, these systems are often limited to experimental environments and are not integrated into user-friendly mobile applications.

2.4 Mobile-Based Civic Engagement Applications

Several mobile applications have been developed to increase citizen participation in governance by allowing users to report local issues. While these apps improve accessibility, they generally lack advanced features such as AI-based issue detection, real-time analytics, and centralized dashboards for authorities. Many also suffer from low scalability and poor user engagement.[5][6]

1.1 Cloud-Based Backend Solutions in Smart Applications

Modern applications increasingly rely on cloud platforms for scalability, real-time databases, and authentication services. Technologies like backend-as-a-service (BaaS) simplify development and improve performance. However, many existing civic platforms do not fully utilize these capabilities to provide seamless real-time updates and efficient data management.[7][8]

2. PROPOSED SYSTEM

2.1 Proposed System

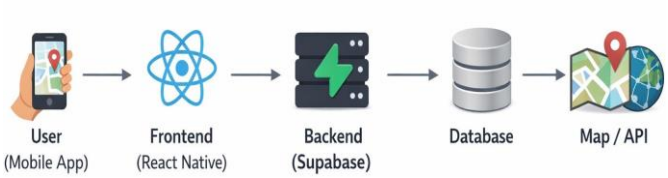


Fig 1- Proposed System

The proposed system, UrbanEye, is an AI-powered urban issue mapping platform designed to enable citizens to report civic problems efficiently and assist authorities in resolving them through a centralized system.[3] The application leverages modern mobile technologies, cloud-based backend services, and intelligent data handling to provide a seamless and real- time experience.

The system allows users to report issues such as potholes, garbage accumulation, broken streetlights, and other infrastructure-related problems using a mobile application. Users can either manually select the issue category or upload an image, which can be further processed for intelligent classification.

2.2 Key Features

The proposed system incorporates several important features that enhance usability, efficiency, and scalability. These features are described as follows:

2.2.1 User-Friendly Mobile Interface

The application is developed using React Native, providing a clean, responsive, and intuitive user interface. It enables users to easily register, log in, report issues, and track previously submitted complaints without any technical difficulty.

2.2.2 Issue Reporting Module

The system provides a structured and efficient mechanism for reporting civic issues. Users can perform the following actions:

- Capture or upload images of the issue
- Select the issue type
- Provide a brief description of the problem
- Share the location of the issue
- Submit the complaint instantly

2.2.3 Real-Time Map Integration

All reported issues are displayed on an interactive map interface. This feature allows both users and authorities to visualize the exact geographical location of problems, improving transparency and enabling faster decision-making.

3.2.4. Backend Integration (Cloud-Based)

The system utilizes Supabase as a backend service to ensure scalability and real-time performance. It provides the following functionalities:

- User authentication and secure login
- Real-time database for storing issue data
- Cloud storage for images and media files

3.2.5. Admin Monitoring Dashboard

An administrative dashboard is provided for authorities to efficiently manage reported issues. Through this dashboard, administrators can:

- View all submitted complaints
- Track user activity
- Monitor the status and resolution progress of issues

3.2.6. AI-Based Enhancement

To improve system intelligence, AI techniques have been integrated. These enhancements include:

- Automatic detection and classification of issues from images
- Improved accuracy in identifying problem types
- Reduction in manual user input

2.3 Working of the System

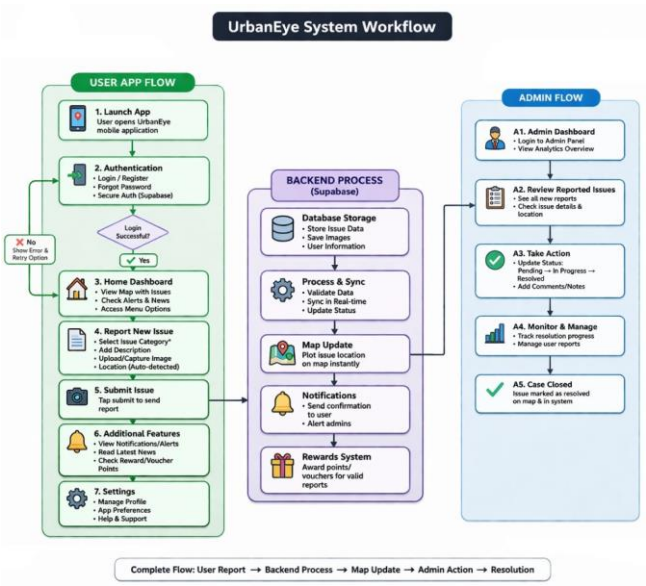


Fig 2- System Work

The working of UrbanEye can be described in the following steps:
1. The user registers and logs into the application.
2. The user reports an issue by selecting category, uploading an image, and adding details.
3. The system captures the location and stores the data in the database.
4. The reported issue is displayed on the map in real-time.
5. The system sends alerts and updates related to reported issues.
6. Users can access news and manage settings within the application.
7. Admin can view, monitor, and take action on reported issues.
8. The system may provide vouchers or rewards to encourage user participation.

3. SYSTEM ARCHITECTURE

The system architecture of **UrbanEye** is designed as a modular and scalable structure that integrates a mobile application, cloud-based backend, and real-time services. It follows a client-server architecture in which the user interacts with the mobile application, and all operations such as data processing, storage, and retrieval are handled through backend services. This design ensures efficient communication, scalability, and real-time performance.

The user interacts with the system through a mobile application developed using React Native. The application provides features such as user authentication, issue reporting, map visualization, alerts, and settings management. The frontend is responsible for handling the user interface and user experience, capturing inputs such as images, location, and issue details, and transmitting this data to the backend through APIs.

The backend of the system is powered by Supabase, which provides essential services including secure authentication, communication, and real-time data synchronization.[7] It processes the data received from the frontend, validates it, and ensures seamless interaction between different components of the system.

All data, including user information, issue details, and status updates, are stored in a cloud-based database.[7] Additionally, cloud storage is used to store images uploaded by users. This enables efficient data management, quick access, and reliable storage of large media files.

Map services are integrated into the system to display reported issues geographically. These services use APIs to fetch and update real-time location-based data, allowing users and administrators to visualize issues effectively on an interactive map.

Furthermore, an admin module is included to enable authorities to monitor and manage reported issues. Through the admin dashboard, administrators can view complaints,

track their status, and take necessary actions for resolution, ensuring efficient urban issue management.

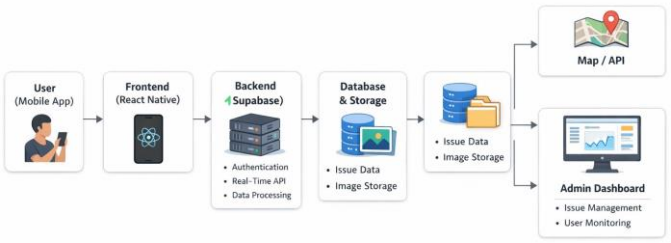


Fig 3- System Architecture

4. METHODOLOGY

The methodology of **UrbanEye** is designed to provide a systematic approach for reporting, processing, and managing urban issues using a mobile-based platform integrated with cloud services. The system follows a client-server architecture where the user interacts with the mobile application, and all data is processed and stored through a centralized backend.

Initially, users interact with the application by registering and logging in securely. They can report civic issues by uploading images, selecting the issue category, adding a description, and sharing their location. This data is collected through the frontend and transmitted to the backend using API-based communication.

The backend system processes the received data by validating inputs and storing them in a cloud database. If implemented, artificial intelligence techniques can be used to analyze uploaded images and automatically classify the type of issue.[3] All data, including images and user details, are securely stored to ensure efficient management and retrieval.

The processed information is then integrated with map services to provide real-time visualization of reported issues. Users can view these issues geographically, while administrators can monitor them through a dedicated dashboard. The system also generates notifications to keep users updated about the status of their complaints.

Finally, administrators review the reported issues, update their status, and take appropriate actions for resolution. Additional features such as alerts, news updates, and reward mechanisms (e.g., vouchers) enhance user engagement and encourage active participation in urban issue reporting.

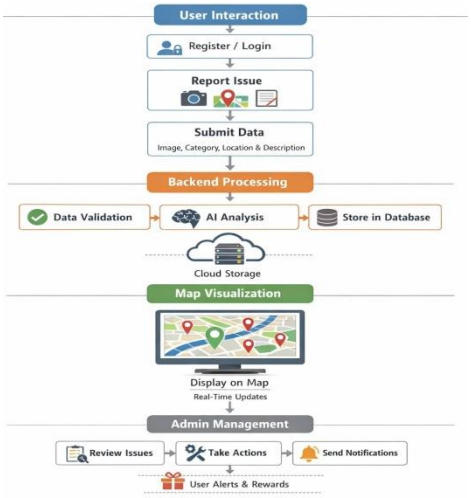


Fig 4- Methodology

1. IMPLEMENTATION & RESULTS

The implementation of **UrbanEye** is carried out using modern mobile and cloud technologies to ensure real-time performance and scalability.[7] The mobile application is developed using React Native, providing a smooth and user-friendly interface. The backend is powered by Supabase, which handles authentication, database management, and cloud storage. Map integration is implemented using APIs to display reported issues geographically.

The system consists of multiple modules, including user authentication, issue reporting, map visualization, alerts, news updates, and an admin dashboard. The following figure shows the home interface of the application, which provides easy navigation to all major features.

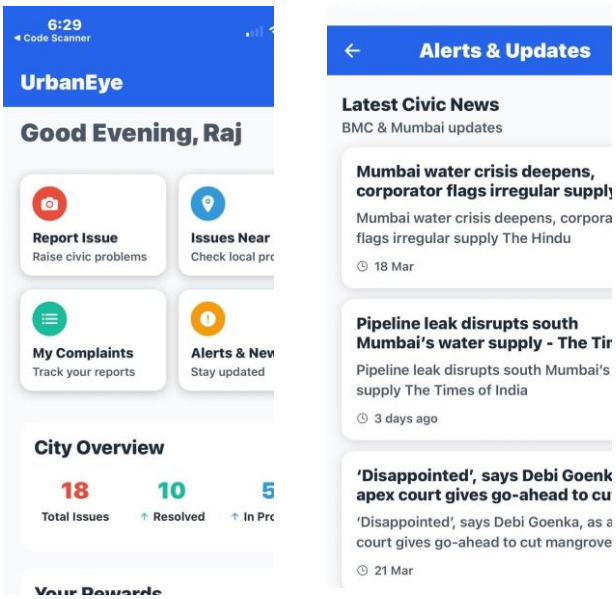
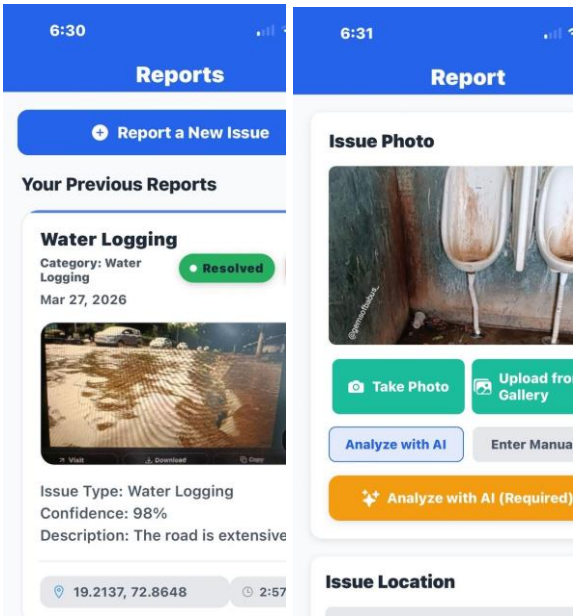


Fig. 5: Home Screen and Alerts & Updates Page of UrbanEye Application

Users can report issues by uploading images, selecting categories, and providing location details. This process is simple and efficient, ensuring quick submission of
complaints. The following figure illustrates the issue reporting interface of the system.



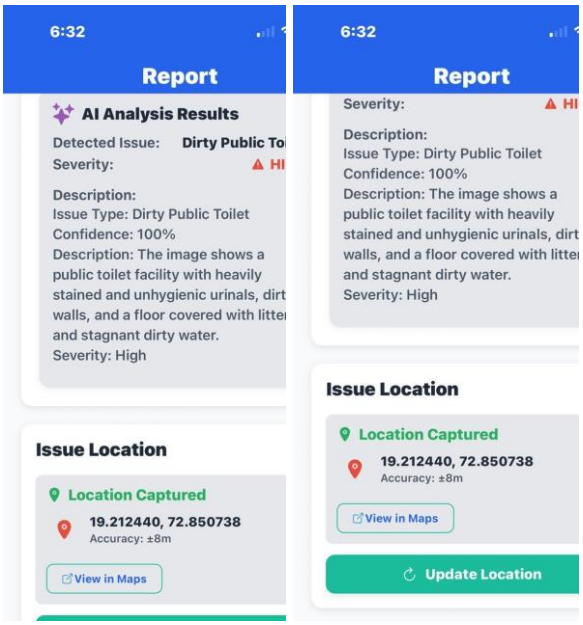


Fig. 6: Working of Reports Screen

The data is then processed and stored in the backend, and the reported issues are displayed on the map in real time. This allows users and administrators to visualize problems geographically. The following figure shows the map visualization of reported issues.

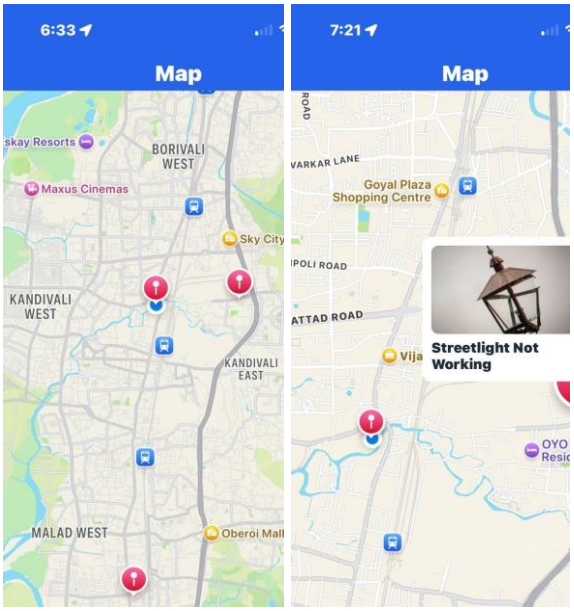


Fig. 7: Map Visualization of Issues

The system also includes a voucher-based reward mechanism to encourage active user participation. Users are provided with reward points or vouchers for reporting valid and useful issues. This feature motivates citizens to contribute towards maintaining urban infrastructure and increases engagement with the platform. The voucher system is integrated with the backend, where rewards are generated based on the authenticity and impact of the reported issue. Users can view and manage their earned rewards within the application, making the system more interactive and user-centric.

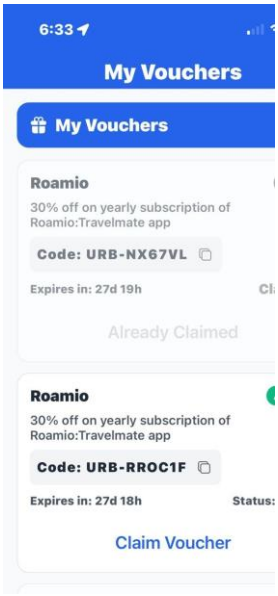
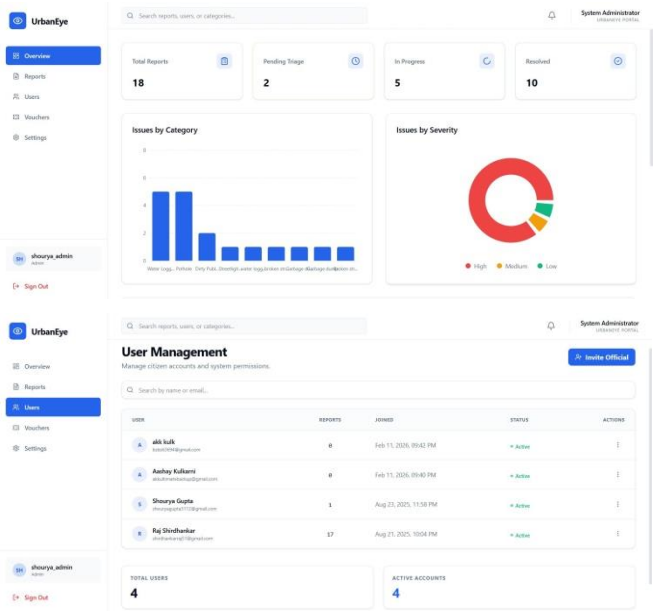
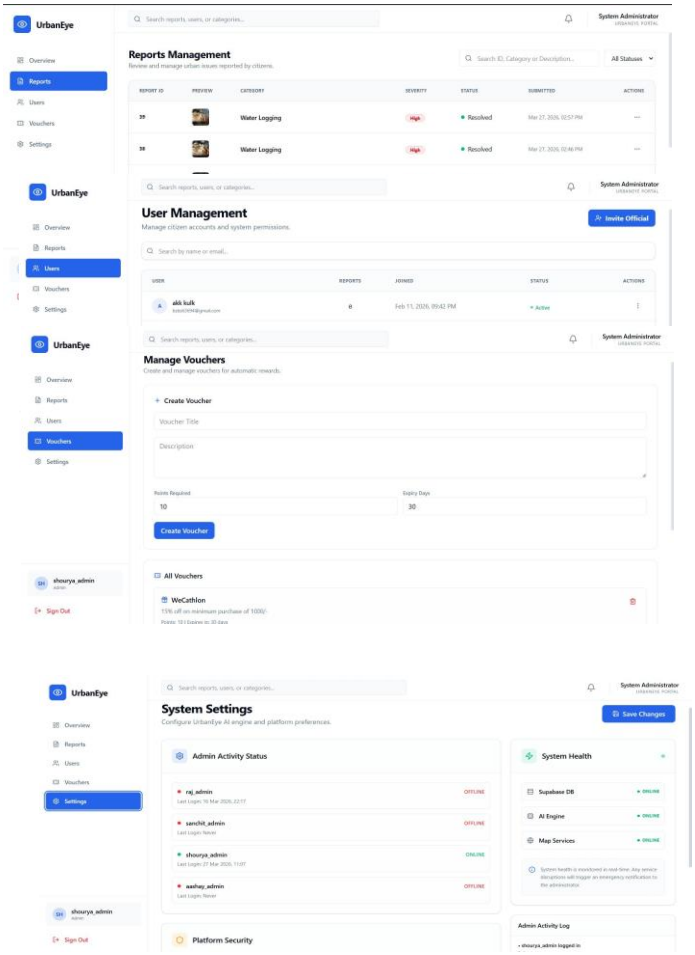


Fig. 9: Voucher System Interface

The results of the system demonstrate that UrbanEye efficiently enables users to report and track civic issues. The real-time map visualization helps in identifying problem areas quickly, while the admin dashboard allows authorities to monitor and manage issues effectively. The following figure represents the admin dashboard and monitoring system.





8: Admin Dashboard and Monitoring System

The system was tested under different scenarios, and it showed reliable performance in terms of data handling, response time, and usability. Features such as notifications, news updates, and reward mechanisms enhance user engagement and participation. The integration of cloud services ensures scalability, while the modular design allows easy future enhancements such as AI-based issue detection and government integration.

2. FUTURE SCOPE

The proposed system can be further enhanced by integrating advanced technologies and expanding its functionality. Artificial intelligence can be implemented more effectively to automatically detect and classify urban issues from images with higher accuracy.[3] Integration with government and municipal systems can enable direct action on reported issues, improving response time and efficiency. The application can also be extended to support real-time alerts, predictive analysis of problem-prone areas, and multilingual support to increase accessibility for a wider range of users.

Additionally, the system can incorporate advanced GIS features for better visualization and analysis of urban data. A social media integration feature can also be introduced, where reported issues are automatically posted on platforms such as Twitter, tagging the respective municipal authorities. This will increase visibility, ensure accountability, and accelerate issue resolution through public engagement.[4]

Furthermore, scalability can be improved to support deployment across multiple cities, making it a comprehensive smart city solution. Features such as IoT integration, automated issue detection using sensors, and enhanced reward mechanisms can further increase user engagement and system effectiveness.

3. CONCLUSION

In this paper, an AI-powered urban issue mapping system, UrbanEye, is presented to address the challenges of inefficient civic issue reporting in urban areas. The system provides a user-friendly mobile platform that enables citizens to report issues such as potholes, waste accumulation, and infrastructure damage in real time. By integrating technologies such as React Native, Supabase, and map-based visualization, the system ensures efficient data collection, processing, and monitoring.

The implementation results demonstrate that UrbanEye improves communication between citizens and authorities while enhancing transparency and accountability. Features such as real-time mapping, notifications, and reward mechanisms encourage active user participation and contribute to faster issue resolution.

Overall, the proposed system offers a scalable and effective solution for smart city management. With future enhancements such as AI-based automation, government integration, and social media connectivity, UrbanEye has the potential to significantly improve urban infrastructure management and support the development of smarter and more responsive cities.

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