



CivicFix: Smart Complaint Routing for Urban Solutions

Mr. Roopesh Kumar B N¹, Shravya R², Shreya P R³, Sunidhi R⁴, Thanusha S⁵

Associate Professor, Dept of CSE, KSIT(Affiliated to VTU), Karnataka, India¹

Student, Dept of CSE, KSIT(Affiliated to VTU), Karnataka, India²

Student, Dept of CSE, KSIT(Affiliated to VTU), Karnataka, India³

Student, Dept of CSE, KSIT(Affiliated to VTU), Karnataka, India⁴

Student, Dept of CSE, KSIT(Affiliated to VTU), Karnataka, India⁵

Abstract: Urban infrastructure maintenance is often hindered by inefficient complaint reporting systems, leading to delays in addressing critical public issues such as potholes, garbage accumulation, broken streetlights, and drainage problems. CivicFix is a cloud-based digital complaint system designed to simplify and automate the grievance redressal process. The platform allows users to report issues by uploading an image, while Google Maps API fetches the location details automatically. A machine learning model then classifies the complaint into categories such as potholes, garbage, streetlights, or drainage, ensuring that it is routed to the appropriate municipal department for resolution.

The system features separate dashboards and logins for both users and department officers, allowing users to track complaint statuses and enabling authorities to efficiently manage and resolve issues. By leveraging cloud storage, AI-based classification, and automated routing, CivicFix enhances urban governance, making issue reporting more efficient, transparent, and community-driven.

CivicFix not only simplifies complaint submission for users but also supports large-scale adoption by utilizing scalable technologies such as ReactJS, Firebase, and AI-powered classification. Its modular architecture allows integration with external APIs, real-time tracking services, and secure cloud storage. As a future-ready civic platform, CivicFix demonstrates how smart urban governance can be achieved through citizen-centric design, automation, and data-driven decision-making.

Keywords: Smart city, urban infrastructure, complaint redressal system, AI-based classification, Google Maps API, cloud computing, Firebase, Web-Based Application, Smart Governance

I. INTRODUCTION

Maintaining public infrastructure is a crucial aspect of urban governance, yet many cities struggle with inefficient and outdated complaint resolution systems. Common issues such as potholes, garbage accumulation, drainage blockages, and malfunctioning streetlights often go unresolved due to delayed reporting, poor tracking mechanisms, and ineffective coordination among municipal authorities. Traditional methods of complaint submission involve manual paperwork, phone calls, or in-person visits, which are timeconsuming and lack transparency. To address these challenges, a modern, AI-driven, and cloud-powered complaint management system is necessary.

CivicFix is a cloud-based digital complaint system that allows users to report public issues with ease. The system begins with users uploading a photo of the problem, which is then processed using Google Maps API to fetch the exact location details automatically. Once the image and location are captured, a machine learning model analyzes the photo and categorizes the issue into one of four types:

- Potholes and Garbage (handled by BBMP)
- Drainage Problems (handled by BWSSB)
- Streetlight Issues (handled by BESCOM)

Each complaint is stored in a separate database table corresponding to the respective department, ensuring that grievances are routed directly to the appropriate authorities without manual intervention.



To facilitate efficient resolution, CivicFix provides separate logins and dashboards for users and department officers. Citizens can submit complaints, track their progress, and receive updates, while officers from BBMP, BWSSB, and BESCOM can view, accept, and address complaints assigned to their department.

By integrating cloud storage, AI-based classification, automated routing, and real-time tracking, CivicFix offers a scalable and transparent solution for urban infrastructure management. It enhances citizen participation, improves municipal efficiency, and promotes faster problem resolution, ultimately contributing to smarter and better-managed cities.

With increasing urban populations and civic pressure, traditional complaint systems are proving inadequate. CivicFix offers a technological alternative that not only streamlines processes but also enhances government accountability. The system is extensible to handle other civic areas such as water supply, sanitation, and public safety, making it a robust candidate for broader e-governance initiatives.

II. LITERATURE SURVEY

1) Smart Urban Governance and Complaint Systems

Traditional grievance redressal mechanisms often involve paperwork, physical visits to municipal offices, and long waiting periods for responses. These manual systems lack efficiency, transparency, and timely communication, resulting in citizen dissatisfaction.

Smart urban governance aims to digitize and streamline these processes using cloud-based platforms, enabling citizens to lodge complaints online via mobile apps or web portals. Such systems enhance two-way communication between the public and authorities, allowing for faster resolution of issues. By leveraging real-time data sharing, notifications, and automated updates, they create a transparent environment where citizens are informed about complaint status and government action. Research has shown that these digital systems not only improve accountability but also increase civic engagement by encouraging more people to report issues in their locality.

2) Image-Based Complaint Categorization using AI

Handling urban complaints manually often leads to misclassification or delayed identification of the problem category, which hinders effective resolution. Artificial Intelligence (AI), particularly Convolutional Neural Networks (CNNs), can analyze and classify images submitted with complaints. For example, a CNN model can be trained to distinguish between images of potholes, overflowing garbage bins, waterlogging, and other civic issues.

This automated categorization helps in:

- Reducing the need for human intervention in sorting complaints,
- Minimizing errors due to subjective judgment,
- Speeding up the redirection of complaints to relevant departments.

This technique significantly enhances the scalability and responsiveness of smart complaint systems by handling large volumes of user-generated visual data efficiently.

3) Geolocation and Smart Routing with Google Maps API

Geolocation is critical for accurately pinpointing the location of urban issues. By integrating the Google Maps API, complaint systems can automatically geotag issues based on the user's current location or the uploaded image's metadata. This ensures:

- Complaints are mapped precisely without requiring users to manually enter location details,
- Authorities can visualize problem hotspots and allocate resources efficiently,
- Complaints are routed to the appropriate municipal zones or departments based on geofencing or jurisdictional boundaries.

Additionally, smart routing features can optimize the travel path for maintenance teams by prioritizing complaints in the same vicinity, improving response time and operational efficiency.

4) Role of Dashboards in Civic Management

Dashboards serve as the control center for both users and civic officers. For users, dashboards allow them to:



- Track the status of their complaints,
- View responses or updates from officials,
- Vote or comment on other complaints.

For authorities, officer dashboards provide:

- A centralized overview of complaint metrics (e.g., number of pending, resolved, or high-priority complaints),
- Data visualizations (graphs, heatmaps, etc.) to aid in decision-making,
- Performance tracking of field workers and departments.

By organizing and displaying real-time data intuitively, dashboards improve transparency, accountability, and data-driven governance.

6) Cloud Storage and Scalable Infrastructure

As urban populations grow, the volume of complaints and accompanying data (like images and status logs) increases. A cloud-based infrastructure offers the flexibility to scale on demand while ensuring data security and high availability. Features include:

- Centralized storage of complaint-related data across cities or departments,
- Real-time synchronization of data across user devices, officer dashboards, and backend systems,
- Automatic backups, versioning, and audit logs to maintain transparency and history.

Moreover, cloud integration supports multi-platform access (mobile, web) and interoperability with other urban systems, such as emergency services or traffic management platforms.

III. OBJECTIVES

- 1) To develop a cloud-based complaint redressal system for resolving public infrastructure issues efficiently.
- 2) To integrate AI-based classification for categorizing issues like potholes, garbage, and drainage from user-uploaded images.
- 3) To use Google Maps API for real-time and automatic location tracking of complaints.
- 4) To implement a user and officer dashboard for effective complaint monitoring and resolution.

IV. METHODOLOGY

The methodology for “CivicFix: Smart Complaint Routing for Urban Solutions” is designed to ensure an efficient, automated, and transparent complaint management system for urban infrastructure issues. The system integrates cloud computing, artificial intelligence, and geolocation services to streamline the process of reporting and resolving civic complaints. The methodology outlines the system architecture, data processing techniques, complaint routing mechanisms, implementation details, and testing procedures.

A. System Architecture

- a) CivicFix is a cloud-based digital complaint management system that enables users to report urban issues through a web-based platform.
- b) The architecture consists of ReactJS(Frontend), Node.js(Backend), Firebase or PostgreSQL(Database).
- c) *APIs Used:*
 - 1) *Google Maps API:* Fetches real-time geolocation of complaints.
 - 2) *OCR (Optical Character Recognition):* Extracts text from images for better complaint categorization.
- d) The system follows a client-server model, where the user interacts via the web application, and the backend processes and routes complaints to the appropriate authorities.

B. Data Collection & Processing

- a) *Image Upload:* Users can submit a picture of the issue (e.g., pothole, garbage, streetlight).
- b) *Text Description:* Users can enter additional details about the complaint
- c) *Location Tagging:* The system automatically captures the complaint location using Google Maps API.

C. AI-Based Classification

- a) *Image Recognition:* AI processes uploaded images and categorizes them into predefined complaint types (e.g., pothole, garbage, streetlight).



- b) *OCR for Text Extraction*: Extracts readable text from uploaded images to enhance complaint classification.
- c) Once the complaint is processed, it is stored in the Firebase database, along with user details, timestamps, and complaint status.

D. Complaint Routing Mechanism

- a) *Complaint Categorization*: AI assigns a category to the complaint (e.g., road issue, waste management).
- b) *Department Mapping*: Based on the category and location, the complaint is forwarded to the relevant municipal department.
- c) *Status Updates*: Users receive real-time updates on their complaint status (Pending, In Progress, Resolved).

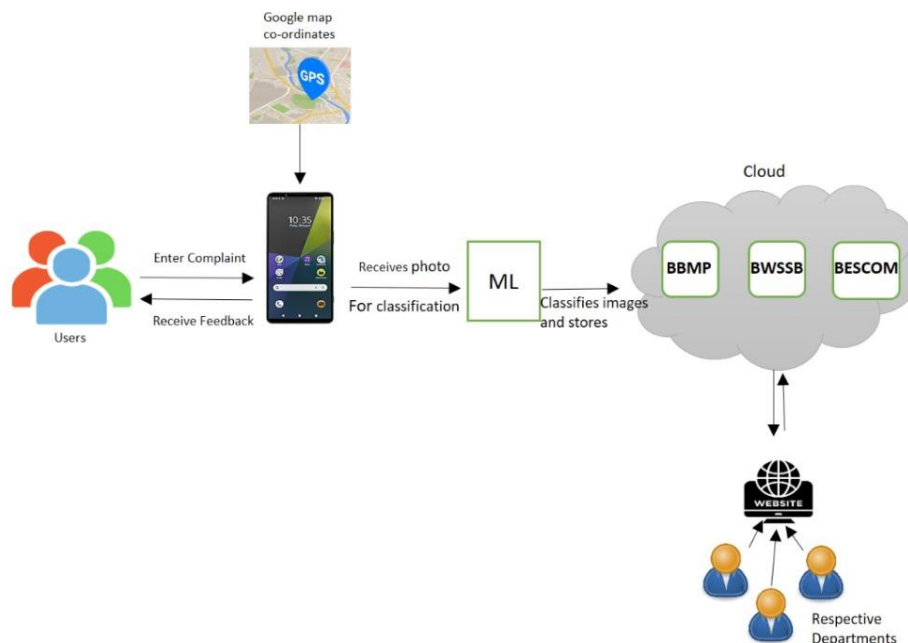


Figure 1: System Architecture of CivicFix

E. User Flow & Interactions

- a) *User Registration and Login*: Users access the CivicFix platform via web or mobile apps. A secure login system using Firebase Authentication ensures user identity.
- b) *Complaint Submission*: After logging in, users submit complaints by uploading images and allowing location access. The system also accepts optional text input for better context.
- c) *Complaint Classification and Routing*: The AI model classifies the image and assigns the complaint to the appropriate department table based on predefined mappings (BBMP, BWSSB, BESCOM).
- d) *Officer Dashboard Interaction*: Logged-in municipal officers view complaints assigned to their department. They can update statuses as “Accepted,” “In Progress,” or “Resolved.”

V. APPLICATION REQUIREMENTS

A. Hardware Requirements:

- a) *CPU*: Intel Core i5 (8th generation or higher) or AMD Ryzen 5, a multi-core processor with decent performance for basic backend development, web development, and running lightweight models.
- b) *RAM*: 8 GB DDR4, sufficient for running a development environment, local servers, and handling smaller datasets for initial testing.
- c) *Storage*: 256 GB SSD (Solid State Drive), SSDs provide faster read/write speeds compared to HDDs, which is essential for fast data processing and smoother development workflow.



User Devices:

Smartphones with GPS and Camera: For real-time complaint submission and evidence capture.

B. Software Requirements:

Frontend Development:

- a) *ReactJS:* For developing a responsive web application.
- b) *React Native:* For mobile application development, allowing cross-platform compatibility.

Backend Development:

- a) *Node.js with Express.js:* To handle API requests and manage the backend logic efficiently.
- b) *Firebase Cloud Functions:* As an alternative for a serverless backend architecture.

Database Management:

Firebase Firestore: A NoSQL database for real-time complaint tracking.

Cloud Storage:

- a) *Firebase Cloud Storage:* To store complaint-related images and documents.
- b) *Google Cloud Storage / AWS S3:* Alternative cloud storage solutions for scalability.

Notifications:

Services: Push notifications (Firebase Cloud Messaging), SMS (Twilio), Email (SendGrid).

APIs and Services:

Google Maps API: For geotagging complaints and visualizing their locations.

VI. CONCLUSION

CivicFix represents a transformative step toward building smarter, more responsive urban environments. By harnessing the power of AI-driven complaint classification and smart routing, our system bridges the gap between citizens and municipal bodies, ensuring that urban issues are not only heard but resolved efficiently. The platform's intelligent architecture enables automatic categorization, prioritization, and redirection of complaints to the appropriate departments—reducing response times, improving service delivery, and enhancing public trust in governance.

As cities continue to grow and urban challenges become more complex, CivicFix provides a scalable and adaptable framework for civic engagement and problem-solving. It empowers citizens to be active contributors in shaping better communities, while equipping authorities with the tools to act decisively and transparently. In essence, CivicFix is not just a complaint management system—it's a vision for a smarter, more inclusive future where technology and civic responsibility go hand in hand.

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