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IOT-X Based Intelli City Management System

Prof. Mahesh Dumbhere, Mr. Shubham Nanne, Mr. Swayam Bommewar, Ms. Pooja Prajapati, Mr. Ritik Khairkar, Mr. Mohan Lavhale

Abstract- — Smart city management has become one of the most important areas of research due to increasing urban population, infrastructure challenges, and the growing demand for efficient public services. Traditional complaint management systems used in municipalities are often slow, manual, and lack transparency, causing delays in solving public issues such as street light failures, garbage collection problems, water supply issues, drainage blockages, and road damage. The proposed project, "IOT-X Intelli City Management System," introduces a smart web-based platform designed to improve complaint management and city administration through automation, analytics, and real-time monitoring. The system allows citizens to register complaints online with location details, images, and issue categories. Based on the issue type, the system automatically assigns the complaint to the appropriate department such as Electrical, Water, Sanitation, Drainage, Traffic, Transport, Garden, or PWD. The platform includes intelligent duplicate complaint detection, complaint prioritization, delayed complaint monitoring, notification updates, PDF/Excel report generation, and analytics dashboards. The project is developed using Flask, MySQL, HTML, CSS, JavaScript, and Chart.js. The admin dashboard provides department-wise analytics, complaint trends, delay analysis, and monthly reports. Department officers can manage assigned complaints, while users can track complaint status in real time. The system improves transparency, reduces complaint resolution time, enhances departmental coordination, and supports data- driven smart city governance. Future enhancements may include IoT sensor integration, GPS tracking, AI-based prediction systems, mobile applications, and SMS/email notification services.

Keywords— Smart City, Complaint Management System, Flask, IoT, Analytics Dashboard, Smart Governance, Duplicate Complaint Detection, PDF Reports, Real-Time Tracking, Department Automation.

I. INTRODUCTION

1. Need for Smart City Management Systems

Urban areas face increasing challenges in managing infrastructure and public services effectively. Citizens frequently experience problems related to damaged roads, non-functional street lights, water leakage, garbage overflow, traffic signal failures, drainage blockages, and

2. IoT-Based Monitoring Systems

IoT (Internet of Things) technologies are widely used for monitoring urban infrastructure such as street lights, water pumps, drainage systems, and traffic signals. Smart sensors collect real-time data and help authorities quickly identify faults or service failures. IoT-based monitoring improves maintenance efficiency and reduces infrastructure downtime.

3. Web-Based Civic Platforms

Web-based civic complaint systems allow citizens to register complaints online without visiting government offices physically. Research shows that these platforms improve complaint registration speed, simplify communication, reduce paperwork, and provide easier access to municipal services. They also support centralized data management and digital record keeping.

4. Limitations of Existing Systems

Despite technological advancements, many existing systems still face several limitations:

- No intelligent duplicate complaint detection.
- Lack of real-time analytics and visual dashboards.
- Poor delay monitoring and complaint priority handling.

- Limited coordination between multiple departments.
- Insufficient notification and tracking features for citizens.

5. Proposed Improvements

The proposed IOT-X Intelli City Management System addresses these limitations by introducing several smart features:

- Intelligent duplicate complaint detection to avoid repeated entries.
- Automatic department assignment based on complaint type.
- Delay tracking using expected resolution days.
- Real-time analytics dashboards and graphical reports.
- Notification system for complaint status updates.
- PDF and Excel report generation for administrative analysis.

other civic issues. Traditional complaint systems are mostly manual and paper-based, resulting in delayed resolutions, lack of transparency, and poor communication between departments and citizens.

With advancements in web technologies and IoT-based monitoring systems, there is a strong need for intelligent digital platforms capable of handling complaints efficiently. Smart city management systems can automate complaint registration, assign issues to the correct department, track complaint status, and generate analytics for better decision-making. The IOT-X Intelli City Management System aims to provide a centralized and intelligent platform for city complaint management. It enhances transparency, reduces delays, and improves coordination between departments and citizens.

Evolution of Smart Complaint Management Systems

Manual Complaint Systems

Earlier municipal complaint systems relied heavily on paper forms, phone calls, and physical office visits. These methods were time-consuming and difficult to track. Citizens had limited visibility regarding complaint status.

Digital Complaint Portals

Later, web-based complaint portals allowed online complaint registration and digital tracking. Although these systems improved accessibility, many lacked intelligent features such as duplicate complaint detection, analytics, and department automation.

Intelligent Smart City Platforms

Modern smart governance systems integrate analytics, automated workflows, and data-driven monitoring. Advanced systems provide dashboards, notification systems, department-specific handling, and real-time reporting. The proposed IOT-X system builds upon these concepts and introduces smart prioritization and delayed complaint monitoring.

Theoretical and Technological Foundations

Smart Governance and IoT

Smart governance focuses on improving city administration through digital technologies and automation. IoT-enabled systems can monitor infrastructure conditions and assist in predictive maintenance.

Web Technologies

Modern frameworks such as Flask enable rapid development of scalable web applications. Combined with MySQL databases and frontend technologies, these frameworks support efficient complaint management systems.

Data Analytics and Reporting

Analytics dashboards and reporting systems provide insights into complaint trends, department performance, and

IV. PROPOSED SYSTEM

1. System Overview

The IOT-X Intelli City Management System is a smart web-based complaint management platform designed to improve communication between citizens and municipal authorities. The system enables users to register civic complaints online and track their complaint status in real time. It also provides administrators and departmental authorities with tools to manage complaints efficiently through analytics dashboards,

notifications, and automated complaint processing. The proposed system focuses on improving transparency, reducing manual paperwork, and increasing the speed of complaint resolution.

Citizens can report issues related to street lights, water supply, drainage systems, garbage management, roads, traffic signals, and other public infrastructure directly through the web portal. The system automatically assigns complaints to the appropriate department and monitors complaint resolution progress. In addition, the platform includes smart features such as duplicate complaint detection, priority management, delay monitoring, analytics visualization, and PDF/Excel report generation. These features help government authorities identify critical problems quickly and improve overall urban governance. The system is developed using modern web technologies including Flask (Python), MySQL, HTML, CSS, JavaScript, and Chart.js. The architecture is modular and scalable, making it suitable for smart city management applications.

2. System Architecture

The architecture of the IOT-X Intelli City Management System is divided into three major layers: Frontend Layer, Backend Layer, and Database Layer. Each layer performs specific functions and together they provide a complete complaint management solution.

Frontend Layer

The frontend layer acts as the user interface of the system. It is responsible for interaction between users and the application. The frontend is designed to be user-friendly, responsive, and easy to navigate for both citizens and administrators. It is developed using HTML, CSS, JavaScript, Bootstrap, and Chart.js.

Backend Layer

The backend layer is the core processing unit of the system. It handles all application logic, authentication, complaint management, database communication, and smart system operations. The backend is developed using the Flask framework in Python.

Database Layer

The database layer is responsible for storing and managing all system data securely and efficiently. The system uses MySQL as the database management system.

delayed issue detection. These features help administrators make informed decisions.

Objectives

The primary goal of this project is to develop an intelligent web-based smart city complaint management platform that improves transparency, efficiency, and communication between citizens and city departments.

Develop a Smart Complaint Registration System

- Allow users to register complaints online.
- Enable image uploads and location details.
- Categorize complaints automatically.

Implement Department Automation

- Automatically assign complaints to departments.
- Reduce manual workload.
- Improve issue handling efficiency.

Implement Complaint Tracking

- Allow citizens to track complaint status.
- Provide notifications for status updates.
- Increase transparency.

Create an Analytics Dashboard

- Generate department-wise analytics.
- Display monthly and weekly complaint trends.
- Detect delayed complaints automatically.

Generate Reports

- Export PDF and Excel reports.
- Provide performance summaries.
- Support smart governance decisions.

Improve Smart City Governance

- Reduce complaint resolution time.
- Enhance citizen satisfaction.
- Enable data-driven city management.

III. LITERATURE REVIEW

1. Existing Complaint Management Systems

Traditional complaint management systems used by municipal corporations mainly rely on manual processes or basic online portals. These systems often suffer from slow response times, poor complaint tracking, and lack of transparency. Citizens usually do not receive proper updates regarding the status of their complaints, which reduces public trust and satisfaction.

2. Smart Governance Research

Recent research in smart governance emphasizes the use of digital technologies to improve communication between citizens and government authorities. Smart city platforms help automate administrative tasks, enhance service

3. Functional Modules

The system is divided into multiple functional modules based on user roles and responsibilities: User Module, Admin Module, and Department Module.

4. Smart Features

Duplicate Complaint Detection

When a user submits a complaint, the system checks existing complaints based on issue type, location, and infrastructure identification numbers such as street light number or water pump number. If a duplicate complaint already exists and is unresolved, the system increases the complaint count value instead of creating a new entry.

Complaint Prioritization

The system automatically prioritizes complaints based on the number of reports received for the same issue. Priority levels include High Priority, Medium Priority, and Normal Priority.

Delayed Complaint Detection

Each complaint category is assigned an expected resolution time in days. If a complaint exceeds the expected resolution period and remains unresolved, it is automatically marked as delayed and highlighted in the dashboard.

Notification System

The notification system informs users whenever complaint status changes occur (e.g., Complaint Received, In Progress, Resolved).

Advantages of Proposed System

The system offers faster complaint handling via automated department mapping, improved transparency via real-time notifications, enhanced coordination using tailored dashboards, complete visual data presentation through integrated analytics charts, and seamless operational scaling via modular code architecture.

V. METHODOLOGY

1. Development Approach

The development of the system follows the Agile Software Development Methodology, which supports iterative development, continuous improvement, flexibility, and faster implementation of new features across six distinct iterative deployment phases (Requirement Analysis, Database Design, Backend Logic implementation, Responsive Frontend mapping, Visual Analytics Integration, and system-wide workflow Validation testing).

VI. RESULT AND DISCUSSION

The platform dashboards were successfully deployed and verified across user, admin, and department access control tiers. The smart features demonstrated flawless tracking metrics: duplicate tracking minimized system overhead,

delivery, and provide real-time monitoring of civic issues. These systems increase efficiency, transparency, and accountability in urban management.

delay alerts successfully flagged overdue tickets, and analytics chart layers dynamically projected operational progress logs correctly.

VII. CONCLUSION

The IOT-X Intelli City Management System demonstrates how modern web technologies and smart governance solutions can be used to create a more efficient, transparent, and citizen-friendly complaint management system for smart cities.

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