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Automated Complaint Resolution Platform Using AI

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Abstract - The Automated Complaint Resolution Platform is a new means of modern public maintenance, which is based on the use of artificial intelligence mutual with the advanced web technologies to make simpler the process of urban & rural complaints submission and resolution. By uploading images, people can report the most common issues like potholes, garbage collection, broken streetlights or water leaks. The platform, which is built on the MERN architecture and uses secure backend microservices, gives modified dashboards to users, authorities, and administrators to guarantee transparency and effectiveness of operations. The automated processing, intelligent map-reading, and real-time tracking make the user experience better and give departments the possibility of tracking and responding to reported issues. In summary, the AI-based model is very helpful in changing the process of handling complaints from being purely reactive to being common, practical, and scalable in civic governance

Keywords: *Automated Complaint Resolution platform using AI, Artificial Intelligence, BLIP-2, MERN Stack, Vision-Language Model, Civic Maintenance, Urban Infrastructure, Complaint Automation, Smart Cities, Digital Governance.*

1. Introduction

The Automated Complaint System is the system that is designed at optimizing the process of inner- city protection with the help of Artificial Intelligence (AI) and existing web technologies. Public services in many municipalities face the same fundamental problems such as potholes, garbage piles, broken street lights, and ruptured water lines, and frequently without sufficient means to authenticate the problem right. The policy alleviates this drawback of public services through a user-friendly picture-taking and uploading web interface. Apart from sorting and directing, the system can also come up with typical responses, predict the decision time, and provide the customers with real-time status updates. Furthermore, the analytics dashboards of the platform allow the administrators to track departmental performance, identify recurring issues and make data-driven decisions to improve service quality. The platform not only enhances capability but also assures stability in complaint management and drastically shortens the resolution timeline through reducing manual dependency. The AI model implemented (BLIP-2) processes the image and determines the associated category and also rates the severity and the complaint is automatically forwarded to the corresponding governmental agency. The (MongoDB,Express.js, React.js, and Node.js).Supervisors manage departmental responsibilities and location these characteristics improve the effectiveness, transparency, and control of municipal governance, which in turn improves the quality of life for all end users and makes the city smarter.

Literature Survey

[1] Sharma and Kulkarni presented a new system powered by natural language processing that classifies public complaints by employing supervised machine learning models along with TF-IDF and word-embedding techniques. Their research proved to be of significant help in the accurate classification of unstructured complaint text but at the same time pointed out the requirement of larger datasets for the purpose of generalization.

[2] The AI-powered complaint management framework was proposed by Rao, Patel, and Desai , wherein BERT-based models were implemented for the automation of complaint clustering, classification, and routing. Their solution did not only cut down reaction times but also boosted efficiency of inter-departmental workflow. The introduction of real-time monitoring tools and feedback loops for the citizens has increased the level of transparency and trust in the public.

[3] Ghosh and Bandyopadhyay , in their research work, introduced a novel pipeline for complaint analysis based on BERT embeddings, which integrated semantic clustering and predictive classification. By means of their study, the recognition of the recurring issue patterns was significantly improved, allowing the formulation of proactive resolution strategies. However, the approach was quite resource-intensive in terms of computation for large-scale deployment.

[4] Mehta and Iyer proposed a data-driven supervision framework that integrates sentiment analysis metrics with time-series data to recognize abrupt fluctuations in complaints. By their method, service failures or operational disturbances could

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be detected earlier. The system relied heavily on accurate baseline modelling for reliable alerting.

2. Proposed Methodology

The Automated Complaint System architecture, which is eagerly available, is a easy, high-performance system that connects users with government agencies and AI-based distribution in a feedback loop. A user upload a photo of an issue in the community and then makes use of a web a application which serves as a trigger for the communication flow via upload. The photography goes to Appwrite, a backend which is controlled by the cloud, and it is then processed and stored temporarily. After that, the objects in the image go to the AI micro service where the BLIP-2 model not only identifies the problem type(like pothole, broken streetlight or garbage) but also allocates a complaints number. The complaint appears on an admin dashboard where it can be transitioned from waiting to in progress and finally to resolved. The authority gets informed about the job. Real-time instant emails are delivered to the consumer, enabling them to see the declaration process on their mobile device. An administration module provides oversight to assist with departmental, locational, and user role setup. Generally speaking, such a highly integrated model preserves a clear communication process, speeds up the resolution of concerns, and gives all stakeholders an accessible limit.

2.1 Proposed Model Diagram

This structure form illustrates how administrators, authorities, and users interact using a united policy. By sending in images, users can easily submit complaints and remain tabs on their status. The system is prohibited by the administrators through adding or varying departments, locations, and authorities. Once a user uploads a image, the AI model (using BLIP-2 through a FastAPI microservice) inspects it, identifies the issues, predicts how hard it will be, and generates a fitting description. This is managed by the backend, which is built on the MERN stack and looks after complaint records, and safe data storage. Upon completion, the relevant authorities can see and handle with complaints that are related to their area, altering their status when needed. To sum it up, the system applies REST APIs to connect all its parts, allowing AI, backend services, and different user roles to work together efficiently for faster and smarter decision of public problems.

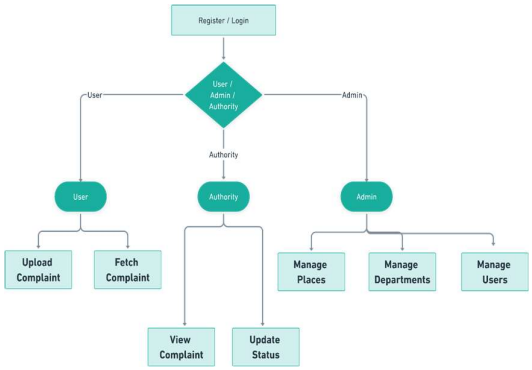

Figure 2.1.1 Block Diagram of Proposed System

Mathematical Formula

1. **Vision Encoding**

   The input image is converted into dense feature vectors using a Vision Transformer (ViT):

$$F_I = \text{ViT}(I)$$

Where:

- I: Input image
- F_I: Patch-level image embeddings extracted using a pretrained ViT

2. **Q-Former Attention (Visual Relevance Extraction)**

   Query tokens attend to image features to extract meaningful visual context:

$$Q' = \text{Attention}(Q, K = F_I, V = F_I)$$

Where:

- Q: Learned query tokens
- F_I: Image features (Key and Value)
- Q': Output query embeddings

3. **Language-Conditioned Scoring (Multiple-Choice Answering)**

   The model calculates similarity scores between each answer choice and the image-conditioned embedding:

$$\text{Score}(a_i) = \text{sim}(Q', \text{Embed}(a_i))$$

Where:

- a_i: Answer option
- $\text{Embed}(a_i)$: Textual embedding of the answer
- sim: Cosine similarity or dot product

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4. **Softmax Over Choices (Probabilistic Output)**
   Softmax is used to compute the probability distribution over multiple choices:

$$P(a_i \mid I, Q) = \frac{\exp(\text{Score}(a_i))}{\sum_j \exp(\text{Score}(a_j))}$$

5. **Cross-Entropy Loss (Supervised Training)**
   The cross-entropy loss function is applied to optimize prediction toward the correct answer:

$$\mathcal{L}_{\text{CE}} = -\log P(a_{\text{true}} \mid I, Q)$$

Where:

- a_{true}: Correct answer label
- $P(a_{\text{true}} \mid I, Q)$: Predicted probability for the correct answer

1. Results

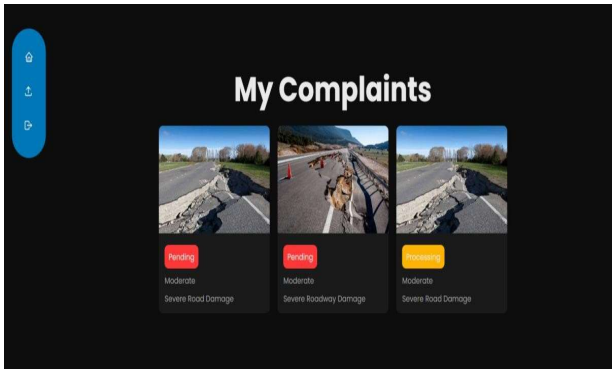

Figure 3.1 User Specific Complaint Page

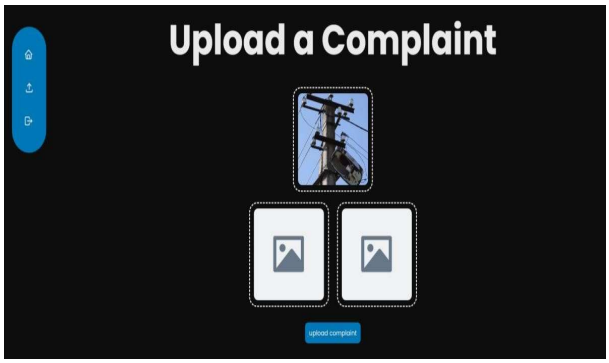

Figure 3.2 Upload Complaint Page

Figure 3.3 Admin Dashboard Page

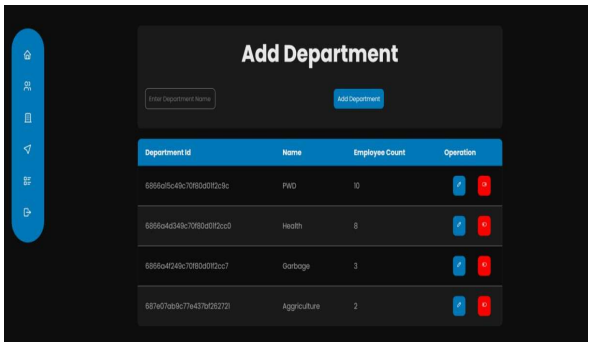

Figure 3.4 Add Department Page

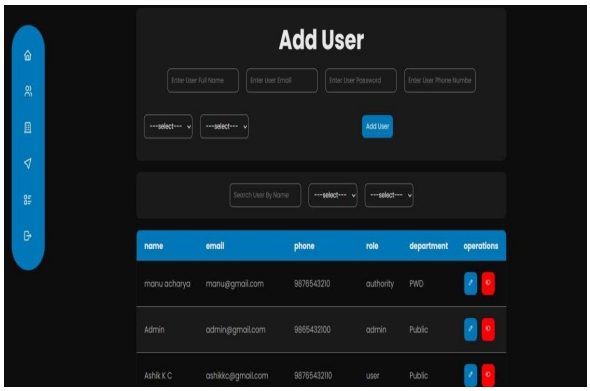

Figure 3.5 Add User Page

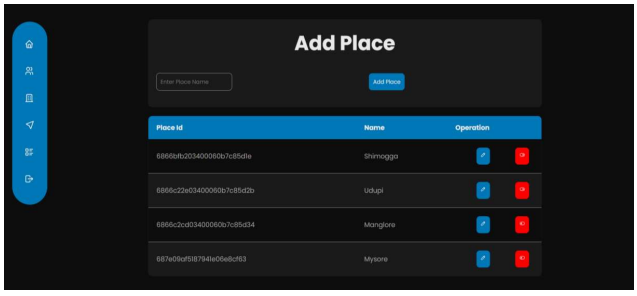

Figure 3.6 Login Page

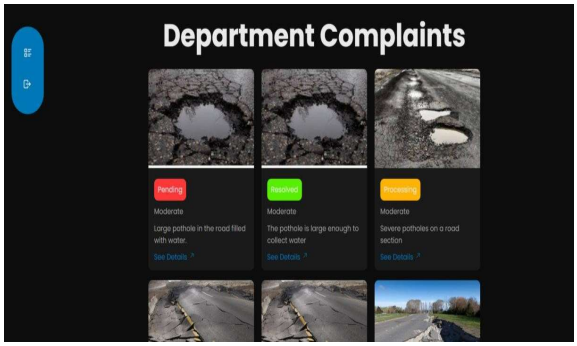

Figure 3.7 Department Specific Complaint Page

Conclusion

Automated Complaint System is a modern public maintenance system that uses computerized actions and artificial intelligence machinery. The organization allows people to submit complaints with pictures, which are then processed by the BLIP-2 model to recognize the issues, their sternness, and to create written reports. The system reduces and boosts the classification of complaints, while at the same time minimizing the human interaction involved in the complete process. The system also creates planned complaints which the authorities can accept in order to provide immediate status updates.This project is an case of how AI can turn the traditional complaint handling into a smart service system that offers users smart practical solutions. It is an intelligent technology based complaint management system that the system is providing better operational performance while building stronger user trust, accountability and satisfaction. It takes a lot of back end support from administrators to handle the system such as determining locations, assigning divisions and authority levels. The system is built on MERN stack which means it is scalable and can be deployed in places which are not conventional urban settings. This system is an import instrument for the interaction between citizens and local government because it not only improves problems reporting and monitoring but also resolution leading to cleaner, safer and more innovative urban areas.

Future Enhancement

The Automated Complaint System will evolve into a state-of-the-art public platform with the help of several new solutions. One of the solutions is a bilingual complaint interface that will make the system accessible to the users who are speaking different languages. A exist heat map combined with geo-analytics control panel would be utilized for smarter and quicker prioritization while GPS data would allow the administrators to see real-time high-density issues in the system. Community leaders will use historic GPS location data combined with AI to give coming into where social issues are likely to occur and take cooperative achievement to stop them from becoming a larger social issue. To help recognize complaints of educational and medical organization in areas ranked at the top due to their risk factors, the model will also include alerts for emergency cases. The IoT will also offer live data from trash containers, leaking pipes, so that the system can frequently update information. Thus, the model creates a preventive system rather than a response based system like currently exists by automatically submitting a complaint due to a user initiated input. The Blockchain technology included in the model will provide local government officials with the capability to track every complaint made to the system and have total visibility about to all records kept throughout the complaint process. The resulting outcome will be a system that creates public trust and responsibility for all departments concerned.

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