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Public Grievance Resolving System

Balaabhishek Nadar[1], Niraj Parmar[2], Aniket Patade[3], Sameer Regunta[4], Prof. Amol Dhumal[5]

Student, Dept. of Computer Engineering, Shah & Anchor Kutchhi Engineering College, Chembur, Mumbai, India[1,2,3,4]

Professor, Dept. of Computer Engineering, Shah & Anchor Kutchhi Engineering College, Chembur, Mumbai, India[5]

ABSTRACT - In today's world, where people are more connected and engrossed in technology, our project uses this as the foundation to answer modern difficulties of grievance registration. The project components are designed in such a way that they reduce the total process of grievance registration to a bare minimum, saving users time. Users can use this Android app to collect photographs, which are then run through a machine learning model to determine the severity of the image, such as high, medium, and low. During the image capture process, users' spatial location will be registered in order to determine the overall location of the issue. The captured images with relevant descriptions will then be sent to a government body while also generating a grievance post that can be viewed and up-voted by fellow citizens. This can apply healthy pressure to authorities while also demonstrating to citizens how efficiently government officials are working on it, thereby maintaining equilibrium.

KEYWORDS: Grievance, Registration, Android, Severity, Up-vote, Spatial Location

I. INTRODUCTION

Technology has updated almost all practises and applications around us, making them more efficient, effective, and affordable, but government systems, such as grievance registration systems, remain somewhat primitive due to the fact that we still have to manually add our own locations, a lack of ways to analyse grievances, and so on. For example, incorrect geographic location insertion can lead to misunderstandings and unwelcome delays for officials. Even when solutions to these difficulties, such as GPS tracking of physical location and machine learning techniques for analysis, are already available.. The power of officials is limited in some ways, so we addressed it and attempted to solve issues of user participation in our application by using a portal where fellow users can post their grievances, but instead of being viewed only by the officials, they would be added to a portal where fellow users could see it and up-vote it or like it if they were experiencing the same issue. As a result of reduced redundancy and a rise in the number of concerns posted, such portals engage the public and enable people find a sense of connection and fulfilment in contributing to the progress of society.

II. LITERATURE SURVEY

A. GPS-based complaint redressal system

Vishesh K. Kandhari et.al created an android application that locates the spatial location of the user when he registers a complaint, it locates the spatial location of the user using Google Maps API. The other addition of the author is the sub-system which forwards the grievance to the upper management if a certain amount of time passes. [1]

B. Image Classification Using Tensor Flow

Rishabh Singhla, Prince Singh, Dr. Rosy Madaan, Dr. Supriya Panda et.al In this research article, a neural network model is created and trained so that, it will be able to predict digits from hand-written images with a high degree of accuracy. Tensor Flow syntax with Keras as its front end has been used for this purpose. The trained model can take an image of a handwritten digit as input and predicts the class of that digit, that is, it predicts the digit or it predicts the class of the input image. [2]

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C. Context-based Image Caption using Deep Learning

SiZhen Li*, Linlin Huang published a research paper that the attention mechanism is also widely used in the current encoding and decoding structure. However, the existing image caption models based on the convolutional neural networks and recurrent neural networks have low accuracy in extracting useful information from images and have problems such as gradient explosion. [3]

D. Image Caption Generation using Deep Neural Networks

Sudhakar J,Viswesh Iyer V,Sree Sharmila T published a paper that, the idea is to extract features from an image, generate captions, and convert the generated captions to speech. This work systematically analyses deep neural networks based image caption generation. With an image as an input, the model can output an English sentence that describes the content in the image by CNN (Convolutional Neural Network), RNN (Recurrent Neural Network), and sentence generation.[4]

E. Image Captioning using Convolutional Neural Networks and Recurrent Neural Network

Rachel Calvin, Shravya Suresh et.al Image Caption is a concept of gathering the right description of the given image on the internet use Computer Vision and natural language processing.[5]

Table 1: Summary of the Literature survey

SR No.	Paper	Advantages and Disadvantages
1	Vishesh K. Kandhari [1]	Advantages: 1. A-GPS utilized has pinpoint accuracy in regards to spatial location detection. Disadvantages: 2. GPS satellite signals do not penetrate building interiors well.
2	Rishabh Singhla, Prince Singh, Dr. Rosy Madaan, Dr. Supriya Panda [2]	Advantages: 1. The spatial locations are stored into a database that is easy to manage and keep a track of. 2. Android application in the paper retrieves the spatial location, which is in a string of numbers format and then converts it into a graphical format through a Map which makes it easier for the user to understand. Disadvantages: 1. Similarly other than spatial detection and registration system related to road systems no other domains are covered.

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3	SiZhen Li*, Linlin Huang [3]	Advantages: 1. The categorization of the scene will help in efficient and rapid analysis of the surroundings. 2. Numerous images are classified in a much quicker way so that accessibility is easier and faster. Disadvantages: 1. We cannot estimate or map the results of a new sample. 2. Varying results are obtained due to outliers.
4	Sudhakar J,Viswesh Iyer V,Sree Sharmila T [4]	Advantages: 1. Better captioning is achieved as the image captioning uses Black box systems. Disadvantages: 1. Only the concept of the image classification was discussed, but no implementation of a real application was shown.
5	Rachel Calvin, Shravya Suresh [5]	Advantages: 1. The automatic tracking of spatial location removes the issue of human error. 2. The sending of grievances to the upper management after a fixed interval of time creates a proper accountability factor for each complaint. Disadvantages: 1. In terms of innovation it is limited to spatial location no other important functionality is provided by the application hence making the overall scope quite limited.

III. PROPOSED SYSTEM

3.1 Grievance Registration Application

Grievance registration App was created with the help of (programming languages). After successfully creating an account and logging in, the user will be taken to a portal that will provide a summary of grievances made by people similar to them; here, the user has the option to comment on it or up-vote it to show his support, in case he encounters the same troubles. When the user initially logs in and opens the home page, its spatial location is registered, and it is dynamic since it is liable to change when the user opens the home page again after a specified period of time.Grievances will be displayed in a card layout format so that the user can quickly scan through them; clicking on them for more information on the grievance will take them to a new tab where additional details about the grievance, such as its image, the spatial location of the problem, the description, the number of up-votes, its status, Score, and

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other miscellaneous details, such as the date of its registration, will be displayed. Because of the graphical style, we were able to display the position of the problem on the Map using an API, making the process of tracking and estimating the location of the grievance easier for the human mind (i.e. government employees) to interpret. The offered navigation bar has three functions: the home button, which contains all of the previously mentioned issues made by fellow users, and the search bar. Then there's the Add Grievance button, followed by the User Profile button.

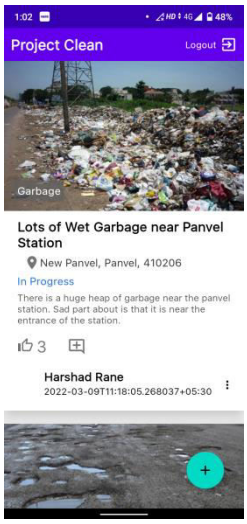

Fig 3.1.1 Home Screen

Fig. 3.1.2 grievance registration

The add grievance button allows them to select an image depicting the problem, such as a heap of garbage.
He then has to click the image with his phone camera, add the title, description, and category from the drop down list, and the spatial location of where the image was captured will be automatically recorded, saving the user the time of manually typing it while also preventing inaccuracies due to human error. After filling out the required fields, the user must submit it in order for it to be effectively registered in the Government database, where the necessary measures will be taken. If the user does not want to click an image of the grievance for whatever reason, he is allowed to do so. Following completion of the action, the user's registered grievance will be posted on the front page and ready to be upvoted or commented on. Finally, the User-profile button is where the user can modify his personal information or simply log out of his account.

3.2 Government Web Application

On the government side, each employee will be given credentials for his or her registered account in order to access the Web Application. These accounts will have different rights; for example, the landing page (Home) will have a dashboard that will display all the statistics of the grievances, such as the number of issues handled, still pending, total numbers, and so on. Using these figures, administrators may follow their progress and gain some insight into the data to help them make decisions (for example, data analysis might aid in budget estimation). The website is roughly separated into two sectors: public sector (Municipal), where all officials can view the cumulative progress and data of all grievances, and private sector (Private). The other is personalized section, which an official can enter after clicking on my workspace button.
In the Municipal part, in addition to data, one may see registered grievances via the Android application and conduct various actions on them. There are many filters in place to filter the grievances based on various characteristics such as the number of up votes, category, status, location, and so on. The initial status that can be assigned to a grievance is registered, and this status is given after the user successfully registers the grievance through the Android application. The second status is Pending, which indicates that no one has yet been assigned to your claim. Third, the In Progress status indicates that a government official has taken your complaint and is working on it. Finally, the rejected status indicates that your grievance has been rejected by the officials for some reasonable reason and that they will not be working on it; they will also offer the rationale. The authority to assign these statues is granted to authorities when they transfer a grievance from the public part to their personal workspace.

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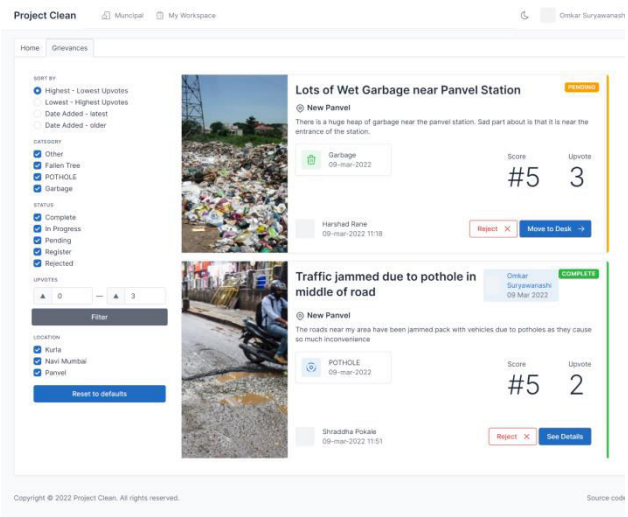

Fig 3.1.3 Web Application dashboard

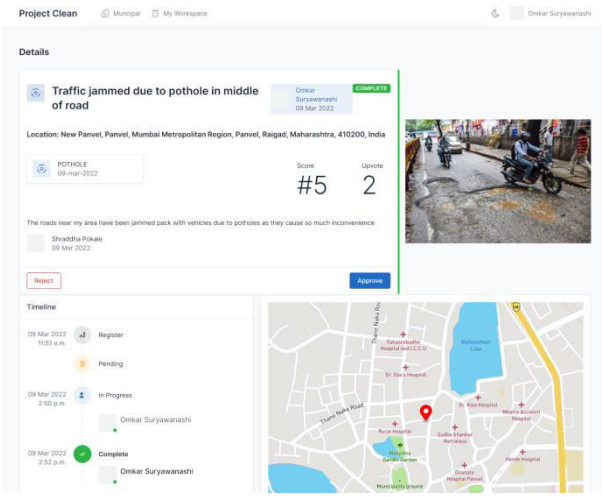

Fig 3.1.4 Grievance detail page

My Workspace has a workstation area that functions as a personal virtual workstation for the user, allowing him to easily create and manage files. Inside these files will be the grievances that he chose from the public domain and brought here to work on. As soon as the official does so, his name is added to the grievance, along with the exact time and date when he began working on it. This makes senior management's job easier because the overall growth of each employee is tracked and workers may be held accountable for their work.

3.3 Scoring Criteria

The Score which is displayed on each grievance plays a vital role in helping the officials Prioritize the grievances, in total there are 4 distinct functions used to calculate this score. Which are Number of days (The older the grievance, higher the weightage), Category (Some categories are considered more important than the rest, for instance, Garbage will have more weight than Fallen Tress), Severity, this parameter is calculated by a CNN model that calculates the severity of a grievance through the image which is provided by the user Between 0 to 1, where 0 is lowest 0.5 is medium and 1 is highest (Example: a small heap of garbage could have a severity of 0.1, on the other hand, a large heap of garbage could have the severity of 0.9), the final function used to calculate score is Number of Up votes(higher the upvotes higher the priority).The Score roughly divides all the grievances into categories of #1 all the way to #10, #1 being the ones with the highest priority and succeeding ones having lower, all the way to #10 which is the lowest.

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3.4 Image Classification for Grievance Severity

Layer and model were utilised in the Tensorflow Keras library. We employed sequential models with two CNN layers and a dense network with two layers after pre-processing.

3.4.1 Pre-Processing

The RGB image is converted to grayscale and resized to 200 × 200 pixels. The supplied image is then flattened into a NumPy array of float values. Following that, the values are divided by 255 to lower the computer power necessary to process them. Labels are assigned a 0 to represent low, 1 to represent medium, and 2 to represent high. The datasets are split at random, with 20% used as test datasets and the remaining 80% used as training datasets.

3.4.2 CNN Layers

Here the CNN layer consisted of the Convolution layer and Max pooling layer. In the first convolution layer we considered 32 filters having a size of 3x3 with activation function being relu, input shape was 200 X 200 X 1, and Max Pooling with pool size 2 X 2.
For the second Convolution layer, we selected 64 filters with size being 3 X 3, its activation function as relu, and Max Pooling with pool size 2 X 2.

3.4.3 Dense Network

In the Dense network, we chose 64 neurons with relu activation functions for the first layer, and 3 neurons with softmax activation functions for the second layer. We used the 'adam' optimizer and the loss function'sparse_categorical_crossentropy' to build the model. The CNN model was trained for a total of ten epochs..

3.5 Normalization

The Range of Input Values(ideally):

Criterions	Range
No. of upvotes	0 - ∞
Severity	0 - 2
Category Value	1 - 3
No. of days passed	0 - ∞

The number of votes is ideally limitless, but in real-world applications we must convert it to finite, thus we used the total number of people registered in that specific area as the upper limit. Similarly, if the status of any grievance does not change after 30 days, it will be awarded special status immediately under the criterion No. of days passed.

The Range of Input Values(Realistically):

Criterions	Range
No. of upvotes	0 - N
Severity	0 - 2
Category Value	1 - 3
No. of days passed	0 - 30

Where N = Total number of users in that city.

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In regards to the Category value, Certain categories hold more importance than others and hence should hold more weight. We have assigned the following weights to the Categories.

Category	Value
Garbage	1
Pothole	2
Fallen Trees	3

Here all the scores will be converted into a range of 0-10

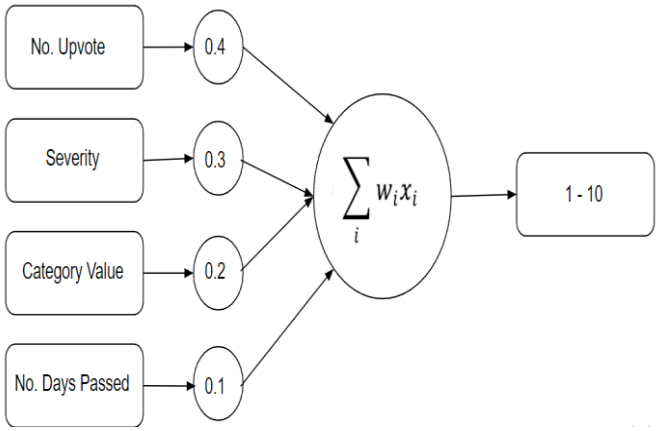
$$x^{'} = ((x - x_{min})/(x_{max} - x_{min})) * 10$$

For the below instance No. of upvotes range from 0 to 200

	Input Value	**Normalised Value**
No. Upvotes	168	8.40
Severity	1	5.0
Category Value	3	10.0
No. Days Passed	22	7.241379

3.6 Weighted Scoring Model

Weight is assigned to each criterion based on its relative importance. The formula of Weighted Scoring Model:



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	Weight	Raw Input Value		Normalize Input Value		Weighted Value	
		Post 1	Post 2	Post 1	Post 2	Post 1	Post 2
No. Upvote	40%	168	37	8.40	1.85	3.36	0.74
Severity	30%	1	0	5.0	0.0	1.5	0
Category Value	20%	3	1	10.0	0.0	2	0
No. Days Passed	10%	22	10	7.2413	3.1034	0.72413	0.31034
						7.58 ≅ 8	1.05 ≅ 2

3.7 Requirement Analysis

A. Software

Operating System	Windows 7/Mac OS and above versions, Android 5.0+
Programming Language	Python,Kotlin,CSS,Javascript,HTML, XML
Database	PostgrSQL

B. Hardware

Processor	2 GHz Intel
HDD	180 GB
RAM	2 GB
Camera	2 MP

3.8 Datasets

In the fallen tree category we have collected 579 images for the dataset. They are further divided into three sub-categories: low, medium, and high.

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Category	Low	Medium	High	Total
Garbage	456	298	234	988
Pothole	218	207	242	667
Fallen Trees	96	172	311	579

IV. RESULT ANALYSIS

Here we display data that has gone through data visualization, which helps workers get a better real-time understanding of the overall operation in terms of the grievance statuses. Some of the graphs utilized to display data are line graphs, pie charts, etc. We have created a dashboard for all these graphs, which will help government officials understand and track the total number of grievances, their statuses, amount of increases or decreases within different time periods, etc. This will help in the planning of a number of things like Budget estimation, appropriate delegation of duties, and suitable distribution of human resources among the task force.

V. CONCLUSION

This project is our approach to making the existing system more efficient, robust and detailed which was done with the help of different modules that we implemented and are thus illustrated in the report. The application also has unique functions like the scoring function, a unique priority function that will calculate the grievance ranking using different parameters and will thus help in ranking the grievances in turn helping the officials to sort out more important ones from the rest. Nowadays, when technology is constantly evolving, even a little innovation can make a huge social impact which we tried to do through the means of our project.

VI. ACKNOWLEDGEMENT

All the team members who participated in this project would like to extend our heartfelt gratitude to the Project Guide of our group, Prof Amol Dhumal, who mentored us and offered us vital expertise and advice on this project, allowing us to develop it beyond our wildest dreams. We would also want to thank Dr. Uday Bhave, our head of department (Computer Engineering), for providing us with a platform on which we could work, develop projects, and demonstrate the practical applications of our academic curriculum. We would like to thank our Principal, Dr. Bhavesh Patel, for bestowing such a golden opportunity on us. The opportunity to work on this fantastic project about grievance registration application has aided us in conducting extensive study and learning more about the subject through Implementation.

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