Cloud Base Traffic Violation Reporting And Rewarding Application

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Abstract- As cities urbanize and population expands, it becomes increasingly difficult, inefficient, and nontransparent to enforce traffic violations with established reporting methods. This study develops a cloud-based system enhanced with mobile technology for real-time reporting of traffic violations by any member of the public via GPS latitude and longitude, pictures and/or video, and secure routing to law enforcement agencies. The system utilizes a client-server architecture, minimizing loss of data, secure routing of reporting traffic violations, and coordinating communications with law enforcement agencies. The system includes built-in analytics mechanisms incentivizing activity, especially based on positive quality of traffic violation reports submitted, and thus allowing for the system to expand and learn. This high volume, high security, and scalable solution to reporting, tracking, and enforcement of traffic violations provides a stronger mechanism and framework for law enforcement agencies to use technology to further engage the public in local urban governance, augmented transportation systems, and increasingly smart and connected street systems.

Keywords- Cloud-based System, GPS, Mobile Technology, Traffic Violation.

I. INTRODUCTION

The Cloud-Based Traffic Violation Reporting and Rewarding Application is a new, citizen-centric solution to improve traffic law enforcement using cloud and mobile technology. This system supports real-time uploads of multimedia evidence of traffic violations, such as disobeying a red light, illegal parking, or reckless driving, allowing users to report those violations as they occur. After submission, traffic authorities can verify the reports and promptly notify the violators using SMS technology and impose fines along with notification of the infraction. As well, users reporting violations are awarded based features, based on validated reports and consistency. Such a system will not only foster meaningful community engagement, but maintaing enforcement efficacy and transparency, and leveraging cloudbased infrastructure to securely handle data and scale if needed. The rest of this document will follow with the

tem flow of the system. Section IV will present the results from the implementation. ude g to II. LITERATURE SURVEY ver

A selection of thorough studies in automated traffic violation detection highlights the variety of approaches and technology for using computer vision, deep learning methods and IoT devices. Four relevant papers that contribute to this field are summarized below:

following structure: section II will review existing literature in

the field of citizen-assisted traffic enforcement systems.

Section III will articulate the architectural designs and work

[1] Traffic Violation Detection System Using YOLOv3 — Chachar G. Patel et al. (IJERT, 2024) This study provides a solution that is based on deep learning for detecting red-light violations with the YOLOv3 object detection model. The authors detect red-light violations using a traffic video data set with annotations to fine-tune the pre-trained YOLOv3 model, which has already been trained with the common objects in context (COCO) dataset. The real-time detection system identifies traffic violations and produces alerts. The authors assess the detection system using precision, recall, and F1score metrics. The authors represent results through visual elements, such as bounding boxes and trajectory plots. The paper considers challenges with environmental conditions, such as lighting and occlusions with other objects, in addition to acknowledging that there is still some computational inefficiencies that can be improved and the scalability of the model will need attention.

[2] Autonomous Real-Time Speed-Limit Violation Detection and Reporting Systems Based on IoV — Samir A. Elsagheer Mohamed et al (DOI, 2021)In this research, the authors introduce an intelligent transportation monitoring system based on Internet of Vehicles (IoV) technology. The system automatically tracks vehicle speed in real time and compares it with posted speed limits using integrated sensors and IoV-based feedback. When a violation is detected, the system automatically reports the offense to the concerned traffic authority without any intervention from humans. This

solution is intended to enable a wide range of smart city applications through greatly diminished requirements for human traffic monitoring. The article emphasizes the system's real-time operation ability, addresses its scalability for larger urban deployment, and describes approaches to expanding the system to monitor other types of traffic infractions. Additional security features are also suggested to maintain data integrity and reliable operation.

[3] Intelligent Traffic Violation Detection — Roopa Ravish et al. (2021) In this paper, the authors described a computer vision based real-time traffic violation detection system -- detecting red-light running, illegal turns, and speeding. The system uses CNNs and YOLO object detector type models using real-time video feeds of traffic surveillance cameras. When a traffic violation was detected the system was capable of sending alerts and communicating with traffic control systems immediately. The authors discuss the scalability of the system, and potential to make manual policing of traffic safer. The authors highlight the systems scalability, and it's potential to reduce reliance on manual enforcement. They include future enhancements, predictive modelling, and adaptiveness to other traffic environments.

[4] Traffic Rules Violation Detection System Using Machine Learning Techniques — Dr. D. Esther Rani et al. (JETIR, 2023) This research introduces a traffic rules violation detection system using CNN-based models created using TensorFlow and tkinter. The system detects varied violations, such as no helmet use and license plate detection in live video analyzing using R-CNN techniques. A GUI enables the user to interact with the system. The authors found that, for the experiment, the motorcycle detection method had an accuracy of 93% and helmet detection accuracy of 85%, for an overall accuracy level of 76%. The authors note that future work could consist of improving data set quality and optimal hardware to ensure best system performance.

III. METHODOLOGY

With the Cloud-Based Traffic Violation Reporting and Rewarding System, we propose a Cloud-based traffic law enforcement that utilizes public engagement in real-time to enhance urban traffic law enforcement with integration of mobile technologies, cloud computing and artificial intelligence systems in order to allow public users to profile and report traffic violation acts to the authority and get rewarded for doing so. The system has a modular and scalable architecture which provides seamless bridging, integration and communication between the public users, traffic law enforcement officers, and all cloud backend services.

Violation Reporting Workflow

The reporting of traffic violation event commences with the use of a mobile application by the user. The following series of event occurs:

1. Capture violation event: The procedure starts when a user is an eyewitness to a traffic offense like illegal parking, beating the red light, or over-speeding. With the use of the mobile application, the user turns on the built-in camera tool to take a clear photo of the offense as it happens. This photo is the main visual proof of the offense and should be taken with attention to clarity, particularly on the vehicle and its number plate.

2. Upload Report: After detecting the violation, the user directly uploads the image from within the app. The image is accompanied by automatically added metadata like GPS coordinates, the date and time of capture in precise detail, and the ID of the user. All this information is securely transmitted to the cloud backend so that all contextual data is provided with the report for subsequent processing.

3.Image Processing and Automatic License Plate Recognition(ALPR):The cloud backend accepts the image upload and sets off a sequence of image processing methods to examine the visual information. With the use of Automated License Plate Recognition (ALPR) technology, the system detects and captures the license plate of the vehicle from the image. This is the most important step to link the violation with a vehicle by converting the visual plate to alphanumeric characters through optical character recognition algorithms.

4. Validation by Authorities:Once the system reads the report, traffic authorities are notified to undertake a final validation process. Authorities review the image to verify the existence of a traffic offense, cross-match the captured license plate information, check the timestamp, and verify that the GPS position is consistent with the reported offense. This validation makes sure that only genuine and correct reports are accepted for action.

5. Reward Allocation: After successful verification from the authorities, the system rewards points or credits to the reporting user. The number of recognition points differs depending on the severity and type of the violation recorded. For example, more serious violations like red light jumping or speeding could have higher rewards than less serious offenses like incorrect parking. The points could later be redeemed for incentives or acknowledgment within the app environment.

SMS Generation and Notification Mechanism

Here are the rules for SMS notification generation after validation and direction has taken place:

1. AutoSMS Generation:The system will have an automated SMS (autoSMS) creator module which will help simplify communications between the platform and vehicle owner who committed the traffic violation. After a violation is captured and ultimately verified, the system will automatically take initiated information from the report. This includes the date and time of the incident, as well as the location using GPS, the type of violation (e.g., speeding, illegal parking or running a light), picture or video evidence that was the basis of the report, and the fine amount as outlined by traffic enforcement policies.

2. User Recognition Tracking: After the user starts actively reporting traffic infractions through the mobile app, the system has a specific section in the app for monitoring their total points of recognition earned. The points are given according to the accuracy, relevance, and severity of each authenticated report made by the user. In the dashboard of the app, users are able to track their performance overtime, see a point breakdown per report, and observe where they rank compared to the rest of the community contributors.



Figure1:Userside overview



Figure2:Policeside overview

IV. SNAPSHOTS

Snapshot 1: User Registration Page



Snapshot 2: User Login Page

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Snapshot 3: User Dashboard Page



Snapshot 4: User violation Reporting page



Snapshot 5: Violation Records for Police Use

			V	olation Records					
SI No.	Violation Type	Fine Amount	Violation Date	Vehicle Number	Image	Location	Posted By	Fine Status	Action
4	Signal Jump	₹ 40 0/-	12-12-2024 11:57 AM	TN098Y9726	Ver	<u>View</u>	Nanitha	Pending	Send SMS
5	No Heimet	7 500/-	12-12-2024 11:57 AM	TN098J4054	Ver	View	Namratha	Pending	Send SMS
3	No Heimet	t 500/-	12-12-2024 11:56 AM	KA05A12843	Ver	View	Namratha	Pending	Send SWS
2	No Seatbelt	₹ 1000/-	12-12-2024 11:55 AM	R/14CV0002	Ver	View	Namitha	Pending	Send SMS
1	Signal Jump	₹ 400/-	12-12-2024 11:54 AM	GA08AP2798	Ver	View	Namratha	Confirmed	

Snapshot 6: Vehicle details

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Inport favorites 🛛 🛱 Ballot Manager 🗋 Booking.com 🕒 Anazon	🖞 New Tab 🗋 Booking.com	🕈 Express VPK 🌔 LestPass pensetr	d.,				She lavoi			
Velcome Admin			View Violatic	ons View Complaints Vehicle Deta	ls Update Pa	ssword	Logou			
Add Vehicle Info		Vehicle List								
Enter your name	Name	Vehicle Reg No	Mobile No	Address						
Vehicle Reg No:	Namratha	GADBAP2798	8951563469	namratha@gmail.com	Ben	galuru				
Enter vehicle registration number	Namitha	RJ14CV0002	7760423329	namratha@gmail.com	Mys	Mysuru				
Mobile Na:	Kavitha	KA05AJ2843	7760423329	namratha@gmail.com	Ben	galuru				
Enter your mobile number	Anu	MH038F4438	7760423329	namratha@gmail.com	Ben	galuru				
Email	Rakshitha	TN098Y9726	8951563469	namratha@gmail.com	Mar	iglore				
Enter your email	Anvitha	KA03JQ1275	7760423329	namratha@gmail.com	Ben	galuru				
Address	Navya	1009019726	8951563469	namiatha@gmail.com	5en	gaturu				
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V. CONCLUSION

The creation of a cloud-based, automated reporting and rewarding platform for traffic violations could enable significant change to improving road safety and traffic management. This initiative allows citizens to report traffic violations in real time via simple reporting through a mobile application, and encourages participation with a reward-based system. This initiative creates a sense of responsibility and accountability within the community. When communities collaborate with traffic authorities, compliance with rules will improve, leading to safer roads and more disciplined driving behaviors. Overall, this framework has the potential to reduce accidents, improve enforcement, and engage the public in restoring order to traffic regulation.

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