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Unmanned Aerial Vehicle-based Detection of illegally parked vehicles

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Abstract: UAV's alternatively known as drones as used in many fields across various industries. They are used in delivery, sports, surveillance, professional photography, cinematography, military combat, natural disaster assistance security, and the fields using these are growing day by day. Adding computer programs and artificial intelligence into daily life and drone as supporting vision would solve many problems of day to day life. In Mumbai due to daily increase in the number of vehicles, parking has become a major concern of the society, many people park vehicle in unusual manner and even if they find an no parking zone at the spot. For any traffic official to visit each spot would be difficult and there is no manpower for the same using any system which automatically process this would solve the problem by capturing the data, processing it automatically and sending automated actions to the end user.

Index Terms **- UAV, ANPR, OCR.**

I.INTRODUCTION

Technological aspects related to vehicle automation and detection is growing day by day. Unmanned aerial vehicle simply known as drone. Drones nowadays are used in many aspects of daily life such as automatic forest fire monitor, power line detection, surveillance and many more expanding concepts. These technology has been now reduced to a civilian level using artificial intelligence.

The parking issue in India has grown rapidly as the number of vehicles have been increasing daily. This has resulted in traffic jams that extends upto hours. The traffic police department have been struggling to reduce such illegally parked vehicle along the roads. There have numerous illegally parked vehicles that have been going unnoticed because the officer have to manually check out the details some individual/drivers scan even claim to have parked the vehicles properly. In this project we are proposing how a drone surveillance cab be utilized for detection of such illegally parked vehicles. This tool speeds up the process and even reduce the man power required for the same purpose.

The traffic police department we assign an individual who will monitor the illegally parking activity around in the range of the drone. The camera of the same will be mounted on roof which detect the number plate. The system will then convert the captured image into digital form at which it will be stored in a database. The system will then generate alerts which would be sent to email or text message of the data available about the vehicle.

II. LITERATURE REVIEW

Number plate recognition is an important task in modern smart cities that helps in enhancing the efficiency of traffic management, law enforcement, and parking management systems. The traditional methods of number plate recognition is done by optical character recognition (OCR) techniques that use image processing algorithms to extract and recognize the characters from the number plate. However, OCR-based methods suffer from low accuracy and performance due to variations in illumination, weather conditions, and image quality. In past years, deep learning-based approaches have shown significant improvements in license plate recognition accuracy by utilizing convolutional neural network. In [1] a deep learning-based number plate recognition system that uses a CNN to recognize license plate numbers. The system consists of two main components: (a)number plate detection and (b)number plate recognition. In the number plate detection stage, the R-CNN algorithm is used to detect the license plate regions in the input image. A CNN is used to recognize the number plate numbers from the detected regions. The system achieved a recognition accuracy of 98.9%, which is significantly better than the traditional OCR-based methods.

In [2] there is an "automatic license plate recognition system" that uses OCR techniques to recognize the license plate numbers. The proposed system consists of three main stages: (a)image pre-processing,(b) character segmentation, and (c)character recognition. The image pre-processing stage, the input image is pre-processed to remove noise and enhance the contrast. In the character segmentation stage, the characters are segmented from the number plate image using morphological operations. In character recognition stage, the segmented characters are recognized using the OCR techniques. This system achieved a recognition accuracy of 96.43%. In [3] displays an edge-based license plate recognition system that uses template matching to identify similar vehicles. This system consists of two main stages: (a)number plate detection and (b)template matching. In number plate detection

stage, number plate image is detected using the Canny edge detection algorithm. In the template matching stage, the detected number plate area is compared with a pre-defined template to identify similar vehicles. The proposed system achieved a recognition accuracy of 91.6.In [4] there is an RF-based drone detection system that uses machine learning algorithms to detect drones. The proposed system consists of two main stages: feature extraction and classification. In the feature extraction stage, the RF signals from the drones are extracted and processed using a wavelet transform. In the classification stage, the extracted features are classified using machine learning algorithms. The proposed system achieved a detection accuracy of 98.7%.

III.TECHNOLOGY

For this paper we will be using a pluto X model from drona aviation which comes in the category of a mini drone. We selected this drone as it has a great camera quality which comes around to 720fps with 4k resolution as compared to other low quality cameras which were upto 360fps with no 4k resolution. Due to this we could get a better and accurate results.

Google Colab is an online platform that allows users to write and run Python code in a browser. It is widely used by data scientists, machine learning engineers, and researchers due to its convenience and ease of use. To begin with, we have generated a simple HTML website with an input field that allows users to upload an image. This website will serve as the interface for our application. We will call it index.html. Once the user uploads the image, the website will generate a output that points to the details from the database. Next, we will use Python and OpenCV, a popular computer vision library, to process the uploaded image. First, we will convert the image to grayscale, which makes it easier to process. Then, we will apply a noise reduction filter to remove any unwanted elements in the image. After that, we will apply the Canny edge detection algorithm to identify the edges in the image. This algorithm detects the edges by looking for areas where the pixel intensity changes abruptly. The output of this step will be an image with edges marked in white and the background in black. Once we have identified the edges, we will use the findContours method in OpenCV to identify the contours in the image. Contours are simply the boundaries of the white areas in the image, which represent the edges of the object. Now that we have identified the contours, we can use easy OCR, an optical character recognition library, to read any text in the image. This step is useful if the image contains any textual information that we want to extract and process further. After we have read the text in the image, we can generate the output of our application. This output can be a JSON object that contains information about the text in the image, such as the text itself and it's position in the image. We can also include the URL of the uploaded image for reference. Finally, we can use a database to store the details of the text in the image. We can compare the output text with the database and generate details such as the name of the vehicle owner, address, phone number and Email ID.

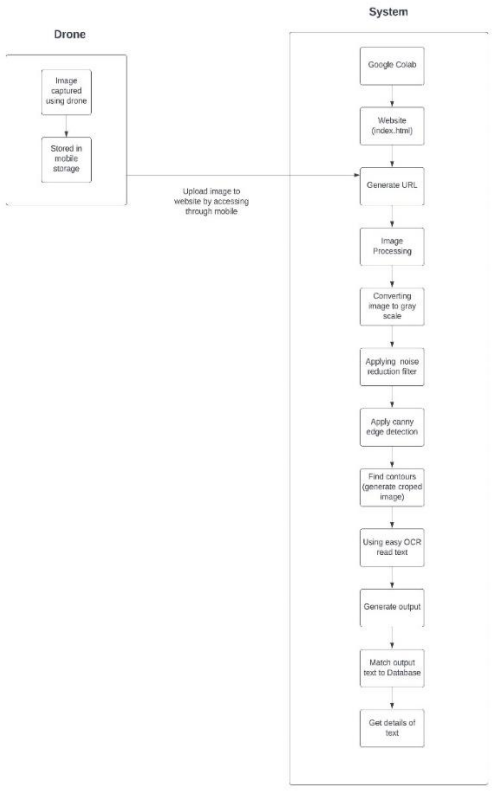

Figure 1: Flowchart of system technology

In conclusion, building a web-based image processing application using Google Colab is a straightforward process that involves several steps. We can use Python and various libraries to perform image processing tasks such as converting an image to grayscale, applying a noise reduction filter, applying edge detection, and reading text from the image. We can then use the output of these steps to generate useful information that can be stored in a database for future reference. This application can be useful in various for managing the traffic related issues and illegal parking a crowded city area.

IV.DRONE AUTOMATION

A. The Pluto X model drone from Drona Aviation comes in the category of a mini and advanced drone that offers a range of features. Some of the key details about its technology are as follows
B. Design: The Pluto X drone has a compact and lightweight design, weighing just 50 grams. It features four propellers and is equipped with an advanced stabilization system that ensures smooth and stable flight.
C. Camera: The Pluto X drone comes with a built-in HD camera that can capture high-quality photos and videos(720 pixels) which is sufficient for our OCR conversion. It also has a live video streaming feature that allows users to view footage in real-time.
D. Flight Control: The Pluto X drone is controlled via a smartphone app, which provides a range of flight control options. Users can adjust the drone's altitude, speed, and direction, and can also set waypoints and plan routes for autonomous flight.
E. Autonomous Flight: The Pluto X drone is equipped with a range of sensors and features that enable autonomous flight. It has an obstacle avoidance system that helps it avoid collisions with objects, and it can also perform pre-programmed tasks such as following a specific route or hovering in place.

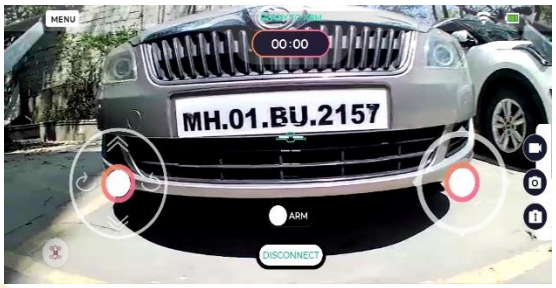

Figure 3: example of drone view of number plate

F. Battery: The Pluto X drone is powered by a rechargeable lithium-ion battery that provides up to 15 minutes of flight time per charge. The battery can be easily swapped out for a spare to extend flight time.
G. Connectivity: The Pluto X drone is equipped with both Wi-Fi and Bluetooth connectivity, allowing users to connect to the drone and control it via a smartphone app. It also has a range of up to 100 meters, allowing users to fly the drone at a distance.

Overall, the Pluto X model drone from Drona Aviation is a powerful and advanced drone that offers a range of features and capabilities. But dues to its low battery life it is only capable of advanced work upon full charge. As we are using this model as for prototype its is enough for our system, but for advance work we suggest more battery life drone.

V.DATA AND RESULTS

A customized python application was created to connect several mentioned solutions to be combined together. The application processes the data that has been captured by the drone using the third party application (pluto controller) developed and managed by drone and capture images or video from the drone. The drone camera provides with a effective picture quality of 720 pixels which is enough for any application dealing with OCR conversion. The user or the controller of the drone can click the image of the number plate of the vehicle in particular position in order to get the desired image to process the image. The user can click multiple images of a single number plate in order to get an accurate output. The table 1 shows us the database used to match the conversion of the image. The database as shown has four different entities related to the number plate and has been fed with data around 20-25 vehicles in order to train the system

	number_plate	owner_name	address	phone_number	email_id
	Filter	Filter	Filter	Filter	Filter
1	21BH2345AA	David D. McDermott	3317 Black Stallion Road Lexington, K...	8594228349	devidD@gmail.com
2	DL7CQ1939	John M. Baez	3986 Hiddenview Drive Philadelphia, ...	2159513344	JohnMBaez@teleworm.us
3	MH20EJ0365	William P. Torres	4244 Gambler Lane Houston, TX 77060	2819464694	WilliamPTorres@dayrep.com
4	15LK10898	Fred T. Coffman	Joachimstaler Str. 85 56357 Ehr	6772788287	FredTCoffman@rhyta.com
5	MH12DE1433	Abbudin Ziyad Rahal	Guntzelstrasse 11 54673 ...	6524271065	AbbudinZiyadRahal@teleworm.us
6	WB06F977	Laura Santos Ferreira	1558 Marcus Street Huntsville, AL ...	2565953711	LauraSantosFerreira@armyspy.com
7	MH04AB1007	Xin Qian Pan	3547 Mutton Town Road Neah Bay, ...	3606452039	XinQianPan@teleworm.us
8	KA24CT2616	Dana Selezneva	Via Valpantena, 147 45030-Guarda ...	3519126159	DanaSelezneva@rhyta.com
9	GJ34BH1992	Nora Denisova	Via Rosmini, 128 84040-Castel Rugge...	3585020348	NoraDenisova@dayrep.com
10	DH12ZC5646	Karina Mordvinova	Via Callicratide, 33 11011-Leverogne ...	3658078102	KarinaMordvinova@teleworm.us
11	MH04DA3423	Talon Meunier	Via Scuderlando, 58 64020-Sant'Atto ...	3335566493	TalonMeunier@dayrep.com
12	MH48DA2534	Cosimo Brown	ul. Słomiana 39 81-072 Gdynia	696387982	CosimoBrown@armyspy.com
13	MH48CD2510	Sunil Desai	1023, Pawan sundar park, Mumbai	8425848448	SinilDesai@infotech.in
14	MH02AS1133	Ana Joy	B-2513, St. John park, Dadar	9886958998	AnaJoy@techteam.in
15	KA13SD7656	Shubhi Shree	701, Sairam plazo, Mumbai	7454414455	ShubhiShree@cistech.in
16	MH05CA1410	Abhishek Nair	b-107,Bhoomi residency	7977894097	abhisheknair0910@gmail.com

Table 1: Sample database with entities such as number plate, owner name, address, phone no, email id

Whenever the image classification is done it is analyzed using the easy OCR library of python. Whenever a image is processed, if the data is not being captured or there is not any matching data the system reverts back with

Figure 3: Sample Image from drone trial

Even though the results are around 88-90% accurate, it is often invalid because of osme characters are often misread for example B for 8 and o for 0. For one object we get numberplate into list of possible OCR readings for numberplate.

Figure 4: Sample image of a bad angle of number plate

To visualize the output that the website produces see figure. After evaluation is finished the data of vehicle owner is displayed on website

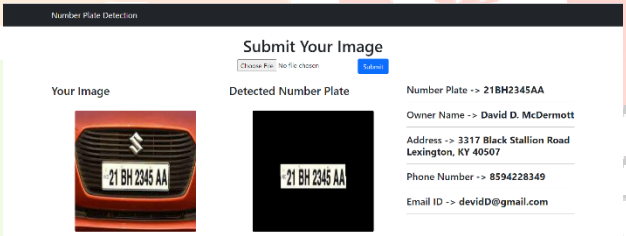

Figure 5: Screenshot of the Website

VI.DISCUSSION AND FUTURE WORK

The application we have developed has several potential applications in managing traffic-related issues and illegal parking in crowded city areas. It can be used to identify vehicles that are parked illegally or for too long, and to generate details about their owners. This information can then be used to issue fines or warnings to the vehicle owners, or to track repeat offenders. In future work, the application can be further enhanced to include additional features such as real-time image processing and automated enforcement. Real-time image processing can be used to capture images of vehicles as they enter and exit parking areas, allowing for more accurate monitoring of parking patterns. Automated enforcement can be used to automatically issue fines or warnings to vehicle owners based on the information generated by the application. Overall, Google Colab provides a powerful and flexible platform for developing web-based image processing applications. By leveraging the power of Python and various libraries, we can easily develop applications that can be useful in various industries. The application we have developed for managing traffic-related issues and illegal parking is just one example of the many applications that can be developed using this platform.

VII. REFERENCES

[1] Vetriselvi, T., E. Laxmi Lydia, Sachi Nandan Mohanty, Eatedal Alabdulkreem, Shaha Al-Otaibi, Amal Al-Rasheed, and Romany F. Mansour. "Deep Learning Based License Plate Number Recognition for Smart Cities." *CMC-COMPUTERS MATERIALS & CONTINUA* 70, no. 1 (2022): 2049-2064.

[2] Salimah, U., V. Maharani, and R. Nursyanti. "Automatic license plate recognition using optical character recognition." In *IOP Conference Series: Materials Science and Engineering*, vol. 1115, no. 1, p. 012023. IOP Publishing, 2021.

[3] Manana, Mduduzi, Chunling Tu, and Pius Adewale Owolawi. "Edge-Based Licence-Plate Template Matching for Identifying Similar Vehicles." *Vehicles* 3, no. 4 (2021): 646-660.

[4] Zhang, Yongxu. "RF-based Drone Detection using Machine Learning." In *2021 2nd International Conference on Computing and Data Science (CDS)*, pp. 425-428. IEEE, 2021.

[5] Khoi, Tran Quang, Nguyen Anh Quang, and Ngo Khanh Hieu. "Object detection for drones on Raspberry Pi potentials and challenges." In *IOP Conference Series: Materials Science and Engineering*, vol. 1109, no. 1, p. 012033. IOP Publishing, 2021.

[6] Böyük, Mustafa, Ramazan Duvar, and Oğuzhan Urhan. "Deep learning based vehicle detection with images taken from unmanned air vehicle." In *2020 Innovations in Intelligent Systems and Applications Conference (ASYU)*, pp. 1-4. IEEE, 2020.

[7] Kusumadewi, Ira, Christy Atika Sari, and Eko Hari Rachmawanto. "License number plate recognition using template matching and bounding box method." In *Journal of Physics: Conference Series*, vol. 1201, no. 1, p. 012067. IOP Publishing, 2019.

[8] Taha, Bilal, and Abdulhadi Shoufan. "Machine learning-based drone detection and classification: State-of-the-art in research." *IEEE access* 7 (2019): 138669-138682.

[9] Park, Jun Ryeol, Nasir Rahim, Seung Ju Lee, Amin Ullah, Mi Young Lee, and Sung Wook Baik. "License Plate Recognition for Parking Management System using UAV Vision." *Adv. Sci. Technol. Lett* 150 (2018): 66-70.

[10] Shi, Weisen, Haibo Zhou, Junling Li, Wenchao Xu, Ning Zhang, and Xuemin Shen. "Drone assisted vehicular networks: Architecture, challenges and opportunities." *IEEE Network* 32, no. 3 (2018): 130-137.

[11] Sarıbaş, Hasan, Hakan Çevıkalp, and Sinem Kahvecıoğlu. "Car detection in images taken from unmanned aerial vehicles." In *2018 26th Signal Processing and Communications Applications Conference (SIU)*, pp. 1-4. IEEE, 2018.

[12] Lee, Dongkyu, Woong Gyu La, and Hwangnam Kim. "Drone detection and identification system using artificial intelligence." In *2018 International Conference on Information and Communication Technology Convergence (ICTC)*, pp. 1131-1133. IEEE, 2018.

[13] Dasilva, Julian, Ricardo Jimenez, Roland Schiller, and Sanja Zivanovic Gonzalez. "Unmanned aerial vehicle-based automobile license plate recognition system for institutional parking lots." In *The 21st World Multi-Conference on Systemics, Cybernetics and Informatics (WMSCI 2017) Proceedings*. 2017.

[14] Zhou, Guang, Jinwei Yuan, I-Ling Yen, and Farokh Bastani. "Robust real-time UAV based power line detection and tracking." In *2016 IEEE International Conference on Image Processing (ICIP)*, pp. 744-748. IEEE, 2016.

[15] Sineglazov, V. M., R. L. Pantyeyev, and V. N. Tkachenko. "UAV detection accuracy and coordinates calculation improvement by means of active and passive radar-location systems." In 2015 IEEE International Conference Actual Problems of Unmanned Aerial Vehicles Developments (APUAVD), pp. 206-209. IEEE, 2015.

[16] Kaur, Er Kavneet, and Vijay Kumar Banga. "Number plate recognition using OCR technique." International Journal of Research in Engineering and Technology 2, no. 09 (2013): 286290.

[17] Qadri, Muhammad Tahir, and Muhammad Asif. "Automatic number plate recognition system for vehicle identification using optical character recognition." In *2009 International Conference on Education Technology and Computer*, pp. 335-338. IEEE, 2009.