ARTIFICIAL INTELLIGENCE

LAB PROJECT

(LPCCS-106**)**

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PlateVista: AI-driven Number Plate Detection

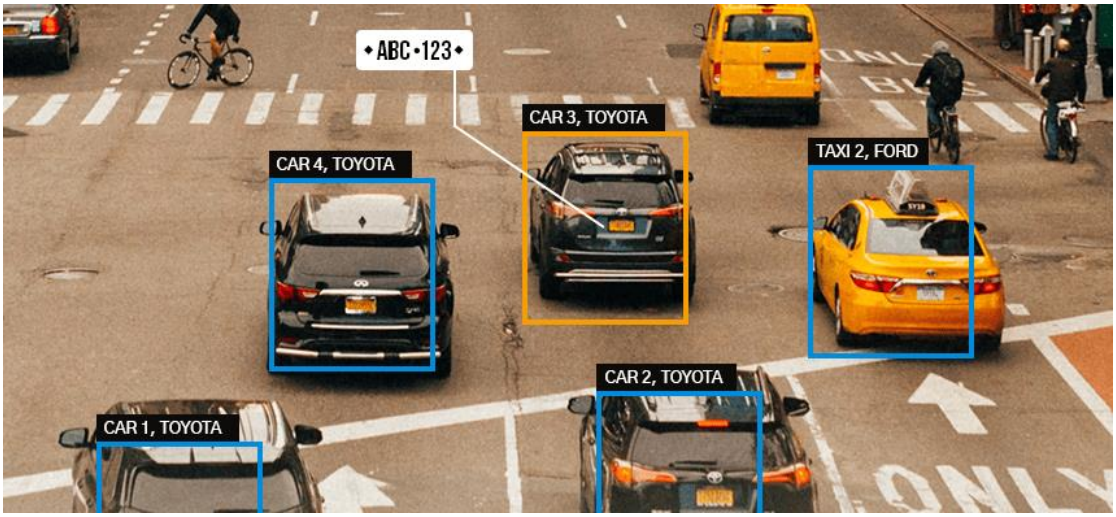

Fig 1.0 - *Vehicle Number Plate Detection Mechanism using Computer Vision*

OBJECTIVES –

1. Real-time Number Plate Detection:
- Implement a real-time system capable of detecting number plates in a live video stream from a webcam.

2. Accuracy and Precision:
- Develop a detection algorithm that accurately identifies number plates, ensuring minimal false positives and false negatives.

3. Integration of Haar Cascade Classifier:
- Utilize a pre-trained Haar cascade classifier specifically designed for detecting Russian number plates.

4. Region of Interest (ROI) Extraction:
- Define a region of interest (ROI) around the detected number plate, ensuring only the relevant area is processed for further analysis.

5. Visual Feedback:
- Provide visual feedback by drawing rectangles around detected number plates in the video feed.
- Display a label indicating "Number Plate" on the identified plates for user understanding.

6. User Interaction:
- Implement a user interaction mechanism allowing the user to save the detected number plates individually.
- Enable saving plates on user command (when the 's' key is pressed).
- Display a confirmation message ("Plate Saved") upon successful saving of a plate.

7. File Storage:
- Save the captured number plates as image files in a specified directory for future reference and analysis.
- Ensure unique filenames (e.g., "scaned_img_1.jpg", "scaned_img_2.jpg", etc.) to avoid overwriting.

8. Webcam :
- Create a clear and intuitive user interface by displaying the processed video feed with detected number plates highlighted.
- Provide feedback messages to indicate the system status, such as successful plate detection and saving.

REAL-WORLD PROBLEMS SOLVED –

1. Enhanced Security: Helps law enforcement agencies in tracking stolen vehicles, aiding in crime prevention and solving cases faster.

2. Traffic Management: Optimizes traffic flow, identifies congestion points, and aids in intelligent traffic management, reducing traffic jams.

3. Parking Management: Manages parking facilities efficiently, guiding drivers to available spaces, and preventing unauthorized parking.

4. Toll Collection: Automates toll collection processes, reducing queues and enabling seamless transactions on highways and toll booths.

5. Law Enforcement: Assists in monitoring and enforcing traffic rules, such as detecting speeding vehicles and unauthorized parking.

6. Urban Planning: Provides data for urban planners to analyze traffic patterns, enabling better city infrastructure development and road planning.

7. Vehicle Monitoring: Allows businesses to track their fleet, improving logistics and ensuring the safety and efficiency of transportation operations.

8. Crime Prevention: Acts as a deterrent for criminals, as the system can identify

vehicles involved in criminal activities.

9. Emergency Response: Helps emergency services by providing real-time data on vehicle movements during emergencies, enabling quicker response times.

10. Customs and Border Control: Assists customs and border control authorities in monitoring vehicles entering and exiting specific areas or borders, enhancing security measures.

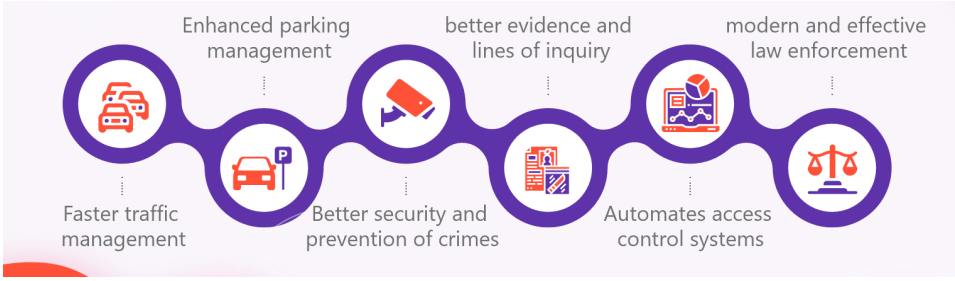

Fig 1.1 – *Need of Automatic Plate detection*

PROJECT WORKFLOW –

1. Capture Video Frames:

- The project starts by capturing video frames in real-time from a webcam or camera feed.

2. Preprocessing:

- Each frame is converted to grayscale to simplify processing and reduce computational load.

3. Number Plate Detection:

- Utilizes the Haar cascade classifier to detect potential number plate regions within the grayscale frame.
- Filters out false positives based on predefined area thresholds to ensure accurate plate detection.

5. Display and User Interaction:

- Draws rectangles around the detected number plates in the video frames, providing visual feedback.
- Displays a label (e.g., "Number Plate") on the identified plates for user understanding.

- Allows user interaction through the 's' key to save the detected number plates as image files.

6. Output and Feedback:

- Outputs the processed frames with detected number plates to a display window.
- Provides user feedback messages, indicating successful plate detection and saving.

7. Continuous Processing:

- The system continuously captures, processes, and displays frames from the webcam, allowing real-time operation.

8. Error Handling:

- Implements error handling mechanisms to address issues related to camera access, frame capturing, and processing errors, ensuring smooth operation.

Fig 1.2 – *Use of Opencv-python*

<u>FUTURE SCOPES</u> –

1. Vehicle Type Recognition: Extend recognition to categorize vehicles (e.g., cars, trucks, motorcycles) based on number plates.

2. Database Integration: Integrate a database for storing recognized plates, enabling historical data analysis and tracking.

3. Cloud-Based System: Implement cloud storage and processing for scalability

and remote accessibility.

4. Mobile Application: Develop a mobile app for capturing and processing number plates using smartphones.

5. Real-time Alerts: Implement alerts for events like stolen vehicles or unauthorized entries into restricted areas.

6. Machine Learning: Enhance accuracy by incorporating machine learning algorithms and continuous training with diverse datasets.

7. Geolocation Integration: Associate plates with specific locations for applications in parking management and traffic analysis.

8. Custom Reporting: Allow users to generate reports based on recognized number plates, aiding in traffic pattern analysis.

9. Integration with IoT Devices: Integrate with IoT devices like traffic cameras, enabling a smart traffic management system.

10. API Development: Create APIs for third-party integration, allowing the system's use in various applications and services.

These future enhancements can significantly broaden the project's scope, making it more versatile and applicable in various domains related to traffic management, security, and urban planning.

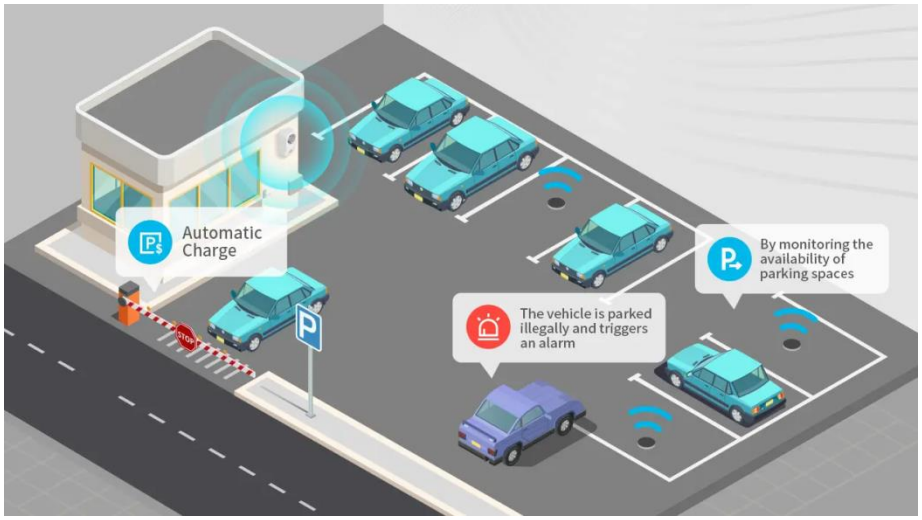

Fig 1.3 - *Smart parking system using IoT*