



# VEHICLE SECURITY SURVEILLANCE SYSTEM FOR PARKING LOTS AND INTRUSIONS

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**Abstract:** The smart surveillance system presented in this study is intended to improve parking lot security by identifying and detecting unwanted vehicle invasions. The system incorporates real-time video capture, Tesseract OCR and OpenCV for license plate identification, and Python's openpyxl for automatic data logging, all of which are driven by the shortcomings of conventional manual monitoring techniques. The solution increases the overall dependability of parking area security by precisely flagging intrusions by matching observed plate numbers with a specified database. For both private and public parking areas, the system offers an effective, scalable solution with little need for human interaction. Its modular design makes future updates and integration with current infrastructure simple.

**Key components:** Image processing, OpenCV, Tesseract OCR.

## I. INTRODUCTION

The need for safe and effective parking management systems has grown as a result of the quick rise in urbanization and car ownership. Conventional parking lot surveillance techniques frequently depend on manual monitoring, which has limitations in terms of scalability, human error, and response times. Because of these restrictions, parking lots are susceptible to theft, illegal car entry, and other security lapses. This project offers an automated vehicle security monitoring system designed for parking lots and intrusion detection in order to allay these worries. The system detects and extracts vehicle registration numbers using optical character recognition (OCR) algorithms, image processing, and real-time video input. To ascertain if a car is registered or perhaps unregistered, these figures are then compared to a pre-established database. To create a reliable and effective solution, technologies like Tesseract OCR for text recognition, OpenCV for image processing, and openpyxl for Excel-based data handling are used. To facilitate recordkeeping and post-event analysis, the system also keeps an exhaustive log of all vehicle entries, complete with timestamps and status.

This intelligent surveillance approach can be implemented in commercial spaces, residential complexes, and institutional parking facilities since it reduces the need for human monitoring involvement, accuracy, and improves facilitates integration with current infrastructure.

## II. PROPOSED SYSTEM

The proposed system is an automated vehicle surveillance solution designed to monitor and secure parking lots by identifying authorized and unauthorized vehicles. The system is composed of the following core modules:

- A. **Video Capture Module :** A surveillance camera is installed at the entrance of the parking area to continuously capture live video. Each frame of the video is processed in real-time to detect incoming vehicles.
- B. **License Plate Detection :** Using OpenCV, the system processes the video frames to locate and isolate the vehicle's license plate region. Preprocessing techniques such as grayscale conversion, noise removal, and contour detection are applied to enhance accuracy.
- C. **Optical Character Recognition (OCR) :** Once the license plate is localized, Tesseract OCR is used to extract the alphanumeric characters from the plate image. This module converts the image into machine-readable text format. D.Database Verification The extracted license plate number is compared against a predefined list of registered vehicle numbers stored in an Excel sheet. If the number is found in the list, it is marked as authorized; otherwise, it is flagged as an intrusion.
- D. **Data Logging :** Using Python's openpyxl library, the system records the following data into the Excel file: Registration Number Date Time Status (Authorized/Intruder) This helps maintain a proper log for future reference and security audits.

- E. Automation and Scalability : The entire workflow is automated, reducing the need for human supervision. The system is modular and can be integrated with other components such as alarms, access control gates, or mobile notifications for enhanced security.

### III. SYSTEM ARCHITECTURE AND DESIGN

Layered and modular architecture is used in the design of the suggested vehicle surveillance system to enable real-time tracking and identification of cars when they enter a parking lot. Developed in Python, the system makes use of key libraries including Tesseract for optical character recognition (OCR), OpenCV for image processing, and openpyxl for Excel-based data storage management. The four primary layers of the overall design are input, processing, decision, and output. The input layer of the system is where a security camera continuously records the live video stream at the entry. To determine whether a vehicle is present, this video is divided into individual frames and processed. To precisely locate the license plate, the frames go through a number of preprocessing steps, such as grayscale conversion, noise reduction, and contour detection. Following detection of the license plate, the Tesseract-powered OCR engine takes the alphanumeric characters out of the plate image. After that, the text is sent to the decision layer, where it is contrasted with a list of registered car numbers that are kept in an Excel document. The car is marked as approved if the number appears in the database; if not, it is marked as an intruder. The detection findings must be stored in the output layer. The system logs the vehicle number, date, time, and status (authorized or intruder) into an Excel file using the openpyxl library. For upcoming security evaluations and audits, this logged data acts as a historical record.

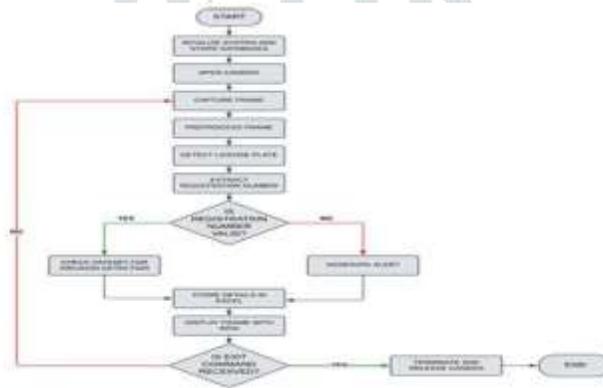


Fig 1.1: workflow diagram

### IV. IMPLEMENTATION

Python's ease of use, adaptability, and abundance of computer vision and data handling packages made it the primary programming language used to create the vehicle surveillance system. Video capture and preprocessing, OCR-based license plate recognition, and vehicle detail verification and logging comprise the three main elements of the system. A webcam or CCTV camera placed at the parking lot's entrance is used to record live video input at the start of the implementation. Using the OpenCV library, each frame is retrieved and put through a number of preprocessing procedures. These procedures involve edge detection, grayscale conversion, and Gaussian blur for noise reduction in order to precisely separate the license plate area from the frame. Once the plate is localized, the Tesseract OCR engine is employed to extract the alphanumeric characters from the plate image. The OCR output is then cleaned and formatted to ensure it matches the expected structure of a registration number. This recognized text is then compared against an existing dataset of authorized numbers, which is stored and managed using an Excel file via the openpyxl library. If the number exists in the dataset, the system marks the vehicle as authorized; otherwise, it flags it as an intruder. Each detection result is stored along with the date and time of entry, ensuring a proper log of all vehicles captured by the system. The output is automatically written to an Excel sheet, which serves as a digital record for future analysis and audits. To make sure the system was accurate and responsive, it was tested using a variety of example photos and real-time feeds. Future improvements, including integration with mobile alerts, gate control systems, or alarms, are made possible by the implementation's modular design.

### V. RESULT AND ANALYSIS

Using live video feeds and a pre-established Department of AI-DS, SIT, Mangaluru Page3 Vehicle Surveillance System database of approved entry, the deployed vehicle surveillance system successfully identifies and recognizes vehicle registration numbers. The system records the outcome, date, and time in an Excel sheet after successfully identifying the vehicle and classifying it as either "authorized" or "intruder." This result shows that the system can operate with reliable precision and speed in real-time settings. To evaluate robustness, the system was tested in a range of lighting scenarios and vehicle entry angles. When paired with OCR via Tesseract, the preprocessing methods produced results for reading and detecting license plate numbers that were comparatively accurate. While obscured plates or poor image quality may affect performance, overall detection and classification accuracy held up well in controlled settings like institutional buildings or protected parking lots.

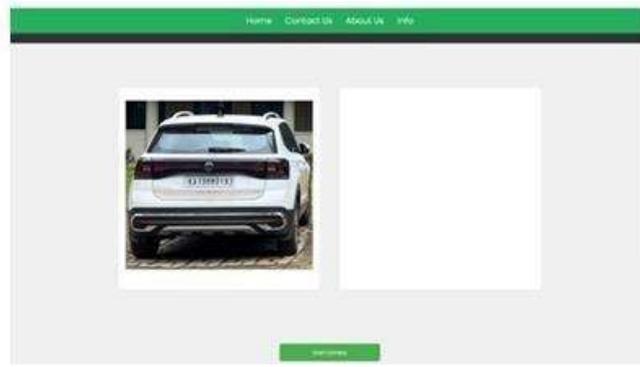


Fig 1.2: User interface

## V. CONCLUSION

The conclusion drawn from the development and testing of this system is that a low-cost, real-time, and automated surveillance mechanism can be effectively implemented using open-source tools and simple hardware. Python and easily accessible libraries were used to guarantee quick prototyping and effective execution. Additionally, future enhancements like automatic gate control or interaction with SMS alert systems are made simple by the modular design. In conclusion, the system offers a dependable way to improve parking lot access management and car security. It is a sensible option for small to medium-sized applications since it not only automates surveillance chores but also keeps a verifiable log for future use.

## VI. REFERENCE

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