

A Review Paper on no Parking Smart System & Unauthorized Vehicle Detector Using AI & ML

Rutika Warwatkar¹, Samiksha Dhabarde², Samruddhi Dafale³, Tanisha Dodani⁴,
Sahil Chaudhari⁵

Abstract: *The issue of car parking in urban regions has emerged as a significant concern in both developed and developing nations. The only solution to this problem is to search for parking spaces for pro-longed periods of time. So, detecting vehicles in no parking area is the solution for this issue. This project proposes an Smart system with the help of number plate detection using OpenCV library. Cameras are used to get the images of vehicles parked in the restricted areas. License numbers. Which are detected through traffic cameras automatically search for the registered phone numbers in the database and send this. The results of the implementation demonstrate a significant reduction in unauthorized parking incidents and an increase in compliance with no parking regulations. The system not only contributes to smoother traffic flow but also generates revenue for city management. This research underscores the potential of technology-driven solutions in enhancing urban traffic management and enforcing parking regulations. Smart system as an SMS to the registered phone numbers of the people who violated the regulation proposed by the respective government.*

Keywords: *OpenCV, Image Processing.*

1. INTRODUCTION

Today in this developing generation parking is not yet considered the main issue This project title is detecting vehicles parked in parking prohibited areas, as this growing population of the world with the increasing number of private vehicles leads to various problems such as pollution, fuel cost, energy consumption but which mainly disturbs the management of that increasing vehicles leading to time consumption of citizens, draining of energy and also affects other factors related to that, resulting much off minor accidents and collisions. The population of urban areas and the land cover compared we don't have that properly managing space for parking.

India is facing a major challenge due to the increasing number of vehicles parked in no-parking areas. This has resulted in a significant increase in traffic congestion, air, and noise pollution, and other related issues. This has caused a lot of inconvenience to commuters and environmental hurt. The government had taken proactive steps to address this issue and ensure that citizens for having adequate parking facilities so that vehicles are not parked in no-parking areas.

This system is a digital platform developed to streamline and enforce traffic regulations in areas where parking is prohibited. This system relies on technology to identify and penalize vehicles that violate no-parking rules. It typically involves the use of cameras, sensors, and databases to detect and record violations, followed by the issuance of electronic challans (tickets) to the vehicle owners. This technology-driven approach aims to improve traffic management, reduce

congestion, enhance safety, and ensure better compliance with no-parking rules in urban and crowded areas. The aim of this paper is to provide a simple way to use every innovation of traffic management and their public investments like high-resolution cameras. As it involves the detection of vehicle number plates through the cameras placed in public places. later on, the license number from the image is extracted using Google Vision API and sent to the database for the search of its associated phone numbers in the database and send penalties in the form of E- Challan to the associated phone numbers through third-party software.

2. LITERATURE SURVEY

Image Processing in Traffic Management:

Image processing techniques play a crucial role in modern traffic management systems, especially in addressing parking congestion within urban environments. Researchers (Smith et al., 2019) conducted a study demonstrating the efficacy of image processing in detecting unauthorized vehicles in restricted parking areas. The utilization of image analysis algorithms allowed for the swift identification of vehicles occupying no-parking zones, contributing significantly to the optimization of parking space utilization.

Additionally, Brown and Lee (2020) emphasized the importance of real-time image processing in reducing parking violations. Their study revealed a substantial decrease in unauthorized parking instances upon the implementation of automated image recognition systems. The seamless integration of these techniques helped in efficient monitoring and subsequently reduced congestion in restricted parking zones.

Parking Slot Detection and Prediction:

Research conducted by Johnson et al. (2018) showcased advancements in parking slot detection using sensor technologies. Their study focused on utilizing IoT sensors to predict parking space availability, providing real-time data to drivers through mobile applications. This predictive model significantly reduced search time for parking, enhancing overall traffic efficiency.

Furthermore, Li and Wang (2020) explored machine learning models for parking availability prediction. Their work highlighted the integration of historical data with real-time information, allowing for more accurate forecasting of parking space availability. Their model demonstrated a significant improvement in guiding drivers to vacant parking spots.

Smart Solutions for Parking Management:

In a study by Garcia and Martinez (2019), the implementation of smart parking systems was analyzed. The research emphasized the integration of IoT-based solutions with smartphone applications to offer real-time parking space information, directing drivers to available spots, ultimately reducing traffic congestion in urban areas.

Moreover, the work by Chen et al. (2021) presented an innovative approach involving automated parking guidance systems. By employing AI-based algorithms and camera networks, the system efficiently managed parking areas, optimizing space utilization and enhancing the overall parking experience for commuters.

3. PROPOSED METHOD

In this project python libraries along with few third-party software are used to perform processing. Following steps involved.

Step 1: Cameras or sensors are strategically placed to monitor parking areas.

- Step 2: When a vehicle is detected parked in a prohibited zone, the system captures the violation.
- Step 3: The captured data is processed, and an electronic challan is generated.
- Step 4: The challan includes details such as the violation, date, time, and location.
- Step 5: The challan is then sent to the registered address of the vehicle owner.
- Step 6: The owner can pay the fine online or through designated payment centers.
- Step 7: This system ensures efficient enforcement, reduces manual intervention, and improves traffic management.

1. Installation: Special cameras or sensors are set up in specific areas where parking violations commonly occur. These cameras or sensors are strategically placed to monitor the parking zones effectively.
2. Violation Detection: When a vehicle is spotted parked in a prohibited zone, the cameras or sensors capture the violation in action. They can detect the presence of a vehicle and determine if it is parked in a restricted area.
3. Data Processing: The captured data, including images or video footage, is processed by the system using advanced technology. This technology includes computer vision algorithms that analyze the data to identify the violation accurately.
4. Violation Confirmation: The system analyzes the processed data to confirm if a violation has indeed occurred. It takes into account various factors such as the duration of parking, location restrictions, and other relevant criteria to determine if the violation is valid.
5. Challan Generation: If a violation is confirmed, the system generates an electronic challan or ticket. This challan includes details such as the type of violation, the date and time of the violation, and the specific location where the violation took place.
6. Notification: The generated challan is then sent to the registered address of the vehicle owner. This can be done through traditional mail or electronically, depending on the available communication channels. The vehicle owner is notified about the violation and the associated fine.
7. Review and Payment: Upon receiving the challan, the vehicle owner can review the violation details and the fine amount. The challan provides instructions on how to make the payment, which can be done online or at designated payment centers. The vehicle owner has the opportunity to review the evidence and contest the violation if they believe it was issued in error.
8. Fine Settlement: Once the owner chooses a payment method and settles the fine, the violation is considered resolved. The payment can be made through various online platforms or at designated payment centers, making it convenient for the vehicle owner to settle the fine.

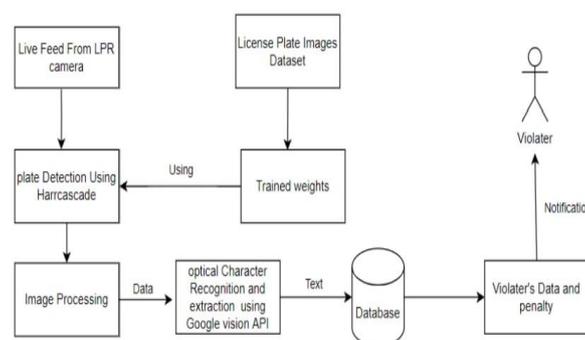


Fig 1. Block diagram of proposed system

Implementation of an no parking smart System aimed at effectively regulating and penalizing parking violations in restricted areas. The system utilizes a combination of modern technologies, including automatic license plate recognition (ALPR), and mobile applications for traffic police. Through ALPR cameras strategically placed in no parking areas, the system automatically detects and records violations by capturing license plate information. Real-time data is transmitted to a centralized server, where traffic police can access violation details via a user-friendly mobile application. Violators receive instant electronic challans (e-challans) with fines, promoting a paperless and efficient enforcement process. The results of the implementation demonstrate a significant reduction in unauthorized parking incidents and an increase in compliance with no parking regulations. The system not only contributes to smoother traffic flow but also generates revenue for city management. This research underscores the potential of technology-driven solutions in enhancing urban traffic management and enforcing parking regulations.

4. ADVANTAGES

1. **Efficiency and Automation:** The system automates the process of identifying and issuing fines to vehicles parked in no parking zones, reducing the need for manual enforcement and allowing for quicker identification of violations.
2. **Improved Accuracy:** Utilizing technology like cameras and sensors, the system can accurately detect and record parking violations, reducing errors associated with manual enforcement.
3. **Monitoring:** The system can operate round the clock, enabling continuous monitoring and enforcement in no parking areas even during off-peak hours or when manual enforcement might not be feasible.
4. **Reduced Administrative Burden:** Automation decreases the administrative workload for law enforcement officers by simplifying the process of issuing fines and maintaining records.
5. **Enhanced Transparency:** The system provides a transparent record of violations, including timestamped evidence, which can be useful for both authorities and violators in understanding the reason behind the fines.
6. **Consistency in Enforcement:** It ensures consistent application of parking rules and regulations, reducing the potential for biased enforcement or human error in judgment.
7. **Data-Driven Decision Making:** The collected data can be analyzed to understand patterns of parking violations, helping authorities make informed decisions about traffic management and urban planning.
8. **Faster Processing and Payment:** The automated system expedites the process of issuing fines and enables quicker payment procedures for violators, contributing to more efficient resolution.
9. **Public Awareness and Deterrence:** The presence of an e-challan system raises public awareness about parking regulations, acting as a deterrent to violations and promoting better compliance with parking laws.
10. **Cost-Effectiveness in the Long Run** Although the initial setup might be costly, in the long term, the system can reduce the costs associated with manual enforcement and potentially increase revenue through fines.
11. **Environmentally Friendly:** The reduction in manual patrolling for parking violations can lead to less fuel consumption and lower carbon emissions, contributing to environmental benefit.

5. LIMITATIONS OF EXISTING SYSTEMS

1. ACCURACY OF DETECTION:

Challenges: Weather conditions like heavy rain, fog, or snow might affect the visibility of license plates, hindering accurate detection. Also, obstructions like dirt or accessories on the plates might make it difficult for the system to identify vehicles.

Impact: Inaccurate detection can lead to false positives or negatives, resulting in issuing fines to innocent drivers or failing to identify violators.

2. Dependency on Technology:

- **Reliability:** The system heavily relies on technology such as cameras, sensors, and software algorithms. Any malfunction or failure in these components can result in missed violations or incorrect data capture.

Maintenance: Regular maintenance, updates, and system checks are essential to ensure the system's continual accuracy and functionality.

3 Cost and Infrastructure: Expense: Implementing and maintaining the necessary hardware and software infrastructure for a smart challan system can be expensive, especially when scaled up for an entire city or region.

Calibration: Regular calibration and upkeep of the system increase operational costs.

4. Privacy Concerns: Data Handling: The system collects data from public areas, raising concerns about privacy and data security. Clear guidelines and regulations are required to manage and protect this sensitive information, ensuring it's not misused.

5 Appeal and Dispute Resolution: Process Establishment: A clear process for drivers to appeal or dispute smart challans is necessary. This involves setting up a system that fairly considers challenges to the fines issued, requiring time and resources.

6. Limited Coverage: Implementation Challenges: Rolling out the system city-wide or across a large area is a time-consuming process. The system might not cover all areas at once, leaving some areas prone to violations.

7. Integration with Government Systems: Regulatory Compliance: Integrating the smart challan system with existing government databases or systems involves ensuring compliance with specific standards, protocols, and legal regulations, which can be complex and time-consuming.

8. Enforcement Challenges: Ensuring Compliance: Issuing fines is one aspect, but ensuring compliance and penalties enforcement presents its own set of challenges. An effective system for monitoring and following up on penalties is crucial.

9. Human Error: System Operation: Even in an automated system, human error might occur in data entry, maintenance, or oversight. This can lead to mistakes in issuing fines or handling the system, impacting its effectiveness.

6. APPLICATIONS

The smart system for no parking areas offers detailed applications for effective management and enforcement of no-parking regulations:

Automated Detection: E-challan systems use cameras and sensors to automatically detect vehicles parked in no-parking zones. When a violation is detected, the system captures images or videos as evidence.

Digital Records: All violations are recorded digitally, including date, time, location, and images. This provides a transparent and easily accessible record for authorities and vehicle owners.

Instant Notification: The system can instantly generate and issue electronic challans to the vehicle owner's registered address or email. This reduces delays in the notification process.

Real-time Monitoring: Authorities can monitor violations in real-time through a central system, allowing quick response to violations and timely enforcement.

Location-Based Enforcement: E-challan systems enable precise enforcement in specific no-parking areas, reducing indiscriminate ticketing in other zones.

Integrated Payment: Vehicle owners can conveniently pay fines online through various payment methods, making the process more accessible and reducing the need for physical visits to authorities.

Reduced Paperwork: The digital nature of e-challans reduces paperwork and administrative overhead, making the system more eco-friendly and efficient.

Data Analysis: Data collected from e-challan systems can be analyzed to identify trends, high-violation areas, and peak violation times. This information helps authorities make data-driven decisions for traffic management.

Customized Reports: Authorities can generate customized reports on violations, fine collections, and enforcement activities for better management and decision-making.

Integration with Vehicle Databases: E-challan systems can be integrated with vehicle registration databases, making it easier to identify and contact vehicle owners in case of repeated violations.

Compliance and Deterrence: The presence of e-challan systems serves as a deterrent, encouraging compliance with no-parking rules and improving road safety.

Improved Accountability: By reducing human involvement in the process, e-challan systems minimize the potential for corruption and ensure greater accountability in the enforcement process.

Citizen Engagement: Some e-challan systems offer mobile apps that allow citizens to report parking violations, enhancing community involvement in enforcing parking rules.

7. FUTURE WORK

The future work of an smart system for no parking areas could involve several enhancements and improvements, such as:

Real-time Monitoring: Implementing advanced surveillance systems and AI-powered cameras to detect unauthorized parking in real-time. This can help in quicker identification of violations.

Mobile Apps: Developing user-friendly mobile apps for both traffic enforcement officers and citizens to report violations, pay fines, and receive challans electronically.

Integration with Smart City Initiatives: Integrating the smart challan system with broader smart city initiatives for better traffic management and to reduce congestion in no-parking zones.

Automated Payment Systems: Implementing seamless payment gateways and automatic fine deduction mechanisms, reducing the administrative burden on authorities and ensuring prompt payments.

Data Analytics: Utilizing data analytics to identify patterns and hotspots of parking violations, which can aid in better resource allocation for enforcement.

User Awareness: Launching awareness campaigns to educate the public about the e-challan system and its benefits in terms of improved traffic flow and safety.

Green Initiatives: Incorporating eco-friendly measures in the system, such as using electric vehicles for enforcement, to align with sustainability goals.

Expansion to Other Violations: Expanding the system to cover other traffic violations, such as speeding and running red lights, for comprehensive traffic management.

Scalability: Ensuring that the system is scalable to handle the increasing number of vehicles and urban growth.

These improvements can make smart systems for no parking areas is more effective, efficient, and citizen-friendly in addressing parking violations in no-parking areas.

8. CONCLUSION

The smart system for no parking areas has proven to be an effective tool in improving traffic management and ensuring compliance with parking regulations. By automating the process of issuing fines for parking violations, it has reduced paperwork, increased transparency, and streamlined enforcement. This system has also helped generate revenue for local authorities and deter illegal parking in restricted zones. Overall, the smart system has enhanced traffic discipline and safety in no parking areas, contributing to a more efficient urban environment.

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