

# A Novel Deep Learning Based ANPR Pipeline for Vehicle Access Control

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**Abstract - Automatic number-plate recognition is a technique that reads car registration plates utilising Open CV and OCR Engine and optical character recognition on photos. In every nation, traffic regulation and identifying the owners of vehicles have become key issues. Finding the owner of a car that travels too fast and against the regulations of the road can be challenging at times. As a result, it is impossible to apprehend and penalise those individuals because the speed of the driving car may prevent traffic officials from retrieving the vehicle's licence plate. Creation of an ANPR (automatic number plate recognition) system. Today, a variety of ANPR technologies are accessible. Although these systems use many approaches, it is still a difficult work since various elements, such as a vehicle's rapid speed, non-uniform number plate, language of the number, and On the total identification rate, changing illumination conditions can have a big impact. Regarding image size, success rate, and processing time as criteria, many ANPR methodologies are discussed. It is recommended that ANPR be expanded.**

**Keywords:** ANPR, access control, character recognition, deep learning, OCR.

## I. INTRODUCTION

ANPR, or automatic number plate recognition, is a technology that 'reads' vehicle number plates using pattern recognition. ANPR cameras 'photograph' the licence plates of the cars that pass them, to put it simply. In order to learn more about the car itself, this "photograph" is subsequently transmitted into a computer system. A computer and cameras are used in ANPR. ANPR uses digital images taken by cameras that are either housed in a mobile unit, stationary unit, or both to "read" Vehicle Registration Marks, or number plates, as a vehicle passes, in-built in traffic vehicles or via Closed Circuit Television (CCTV). Data from the digital image is transformed and then

run through the ANPR system for processing. Our method, which focuses mostly on edge detection, OCR, and finding rectangles in vehicle images, was put out. These days, having a car is more than just a sign of affluence; it is now a need. Any disastrous circumstance, though, is possible when it comes to autos. Therefore, it is always vital to set up the right procedures to improve safety and security as well as to keep an eye on the cars to prevent any accidents. Instantaneously collect vehicle details using image processing is one scenario where it would be useful. Allowing an agency to detect the location of its vehicles. Automatically notify the user if there are traffic violations registered to the vehicle. Utilising a vehicle tracking system that uses the GPS (Global Positioning System) is one such measure. A mechanical gadget that is installed in a vehicle is part of this tracking system.

## II. PROBLEM DEFINITION

A. Online ANPR framework: Online ANPR framework: A real-time tracking system using a surveillance camera is made possible by the quick limiting and explication of tags in an online ALPR framework.

Example: Open ALPR Cloud Watch

B. Offline ANPR framework: Curiously, a logged-off ALPR framework captures the photos of the shovel and dumper licence plates and stores them in a concentrated information server for later processing, such as for vehicle licence plate translation.

Example: Open ALPR Library

Phattaratorn Lismore et al. discussed monitoring indoor air quality in 2018. Headaches, exhaustion, eye and skin irritation, and other environmental health issues are brought on by poor indoor air quality (IAQ).

Since there are so many people present—patients, medical professionals, and staff—in hospital environments, IAQ is a major cause for concern. In addition, medical supplies, medications, and medical gases can degrade air quality. In order to maintain a high level of air quality, IAQ then necessitates routine inspections of the service areas. Our efforts to deploy ANPR in all areas are pushed and inspired by the activities of other nations, as well as by their attempts to address the problems that we confront in our own nation.

#### United States

US law enforcement agencies at the local, county, state, and federal levels frequently deploy mobile ANPR. Approximately 71% of all US police agencies use ANPR in some capacity, according to a 2012 research by the Police Executive Research Forum.

#### United Kingdom

A network of nearly 8000 cameras records vehicle movements, producing between 25 and 30 million ANPR 'read' records per day, which are then stored for up to two years in the National ANPR Data Centre where they can be accessed, analysed, and used as evidence in investigations by UK law enforcement agencies.

#### Saudi Arabia

Vehicle registration plates in Saudi Arabia use white background, but several vehicle types may have a different background. The letters "USD" on diplomatic plates from the United States read "DSU" when read from right to left in the Arabic script orientation.

#### Turkey

All of the registration number cameras have been networked together, and the system has been expanded to enforce average speed over certain distances. Some arteries have speed limits of 70 km/h (43 mph), while others are 50 km/h (31 mph). If a speeding infraction is discovered, photo evidence with date-and-time details is posted to the registration address.

#### Canada

To apprehend drivers of cars bearing Ontario number plates, the police in Ontario deploy automatic license-plate recognition software

#### Challenges in the existing system:

The characteristics of the car licence plate are fully maintained in the developed countries. Examples include the size of the plate, colour of the plate, text style face/size/shade of each character, spacing between subsequent characters, number of lines on the vehicle number plate, script, and so forth. A selection of the images from the common tags used in developed countries. In the majority of academic buildings and parking lots, a security guard must verify membership information by looking for a membership sticker on the windscreen of the vehicle or by looking at the driver's identification card as part of the ongoing car park entry registration process for visitors, staff, or students entering the building. A city like Bangalore has multiple apartment complexes and societies, most of them also verify by checking for membership sticker on the windscreen of the vehicle. If a stranger or unknown vehicle enters, they are required to register which is time consuming. Most complexes even consider it unsafe as once a vehicle enters it is hard to track the movement of the members of the vehicle. Security issues are the main drawback with many cars being stolen, especially when they are left at parking lots even if for a few hours, it is hard to keep a record of all the vehicles entering/exiting at peak usage times. Drawbacks of the traditional system we aim to get a step ahead and address each of them individually when building our solution.

Two key technological prerequisites are necessary for automatic licence plate recognition:

1. The effectiveness of the algorithms used to recognise licence plates
2. The quality of the image acquisition (camera and the illumination conditions)

The better algorithms are:

- Higher is the recognition accuracy.
  - Faster is the processing speed.
  - The range of picture quality it can be utilised on is wider.
3. Varying Indian Number Plate Formats

### III. PROPOSED WORK

Automatic number plate recognition is accomplished utilising a powerful OCR engine, such as Pytesseract, plus significant and extensive OpenCV image processing libraries. A majority of the issues

we have raised can be solved, as we have seen so far, by ANPR. Now that we have a better understanding of the situation, we would like to emphasise the project's scope and the limits we can push. When it comes to number plate detection, noise that is introduced to the image during image capture or as a result of the surrounding environment is the main problem that is typically recognised. Considering this, we can state that using our system, we can implement it in all environments, be it rain or even bright sunlight.

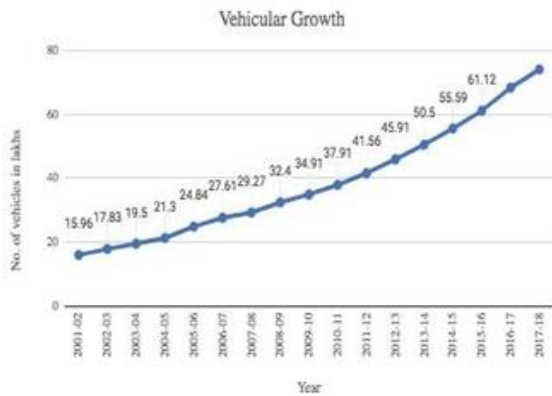


Fig 1: Vehicle growth in India

### 3.1 Digital Image Processing

Analysing and processing analogue and digital signals as well as storing, filtering, and other operations on signals are all part of the field of signal processing, which is found in both electrical engineering and mathematics. Among these signals are those used for transmission, sound or speech signals, image signals, and other signals, etc. The field of image processing, out of all these signals, deals with the kind of signals where the input is an image and the output is also an image. It deals with image processing, as its name implies. Creating a digital system that manipulates a digital image is what digital image processing is all about. As using a camera to take an image is a physical operation. A source of energy is utilised, the sun. For the purpose of picture acquisition, a sensor array is utilised. As a result, when sunlight strikes an object, the sensors detect the quantity of light that object reflects, and the amount of detected data is used to generate a continuous voltage signal. We must convert this data into a digital form in order to build a digital image. As a result, a digital image—actually a two-dimensional array or matrix of numbers—is produced.

### 3.2 Optical Character Recognition

It is customary to digitise printed texts so they can be used for computer operations like cognitive computing, machine translation, and efficient storage, editing, and presentation online(extracted) text-to-speech. Passports are also frequently used as a form of data entry from printed paper data records, whether they be invoices, bank statements, computerised receipts, business cards, mail, printouts of static-data, or any other suitable documentation.

### 3.3 Graphical User Interface

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Through the direct manipulation of graphical icons like buttons, scroll bars, windows, tabs, menus, cursors, and the mouse pointing device, users are able to operate computers and other electronic devices intuitively. Since then, user-centered design in software application programming has been the de facto industry standard for graphical user interfaces.. The ability to communicate with touch screens and voice commands is present in many contemporary graphical user interfaces. design guidelines for graphical user interfaces

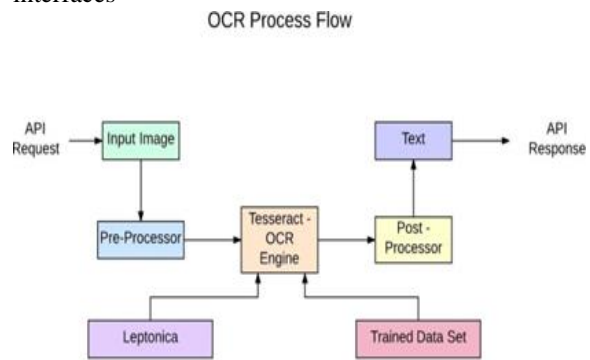


Fig 2: Tesseract Architecture

The model-view-controller software pattern, which distinguishes between internal representations of information and how information is presented to the user, forms the basis for the design of graphical user interfaces. This pattern creates a platform where users are shown which functions are possible rather than

being required to enter command codes. Visual widgets that are built to respond to the type of data they contain and support the actions required to complete the user's task are used by users to manipulate information.

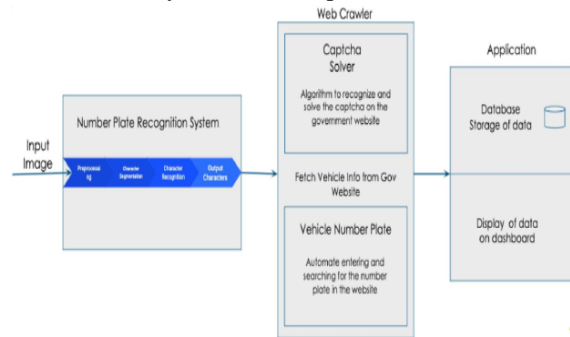


Fig 3: System Architecture

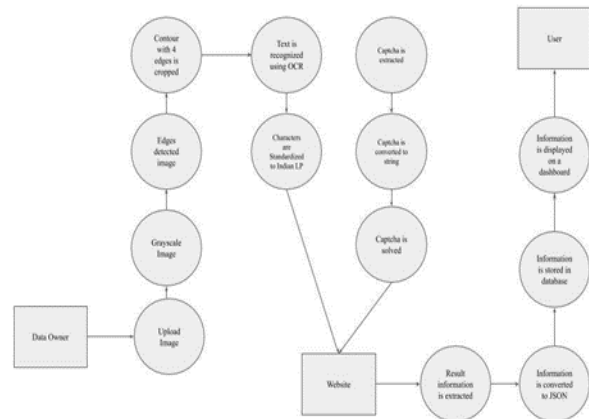


Fig 4:Data Flow Diagram of the Proposed System

VII.RESULTS

In the process of a product's development life cycle, testing is a crucial step. Testing is extremely important for assuring software reliability and quality assurance. Each test has a distinct objective, but they all check to see if all the system's components have been correctly integrated and are carrying out their assigned duties. The testing procedure is actually done to ensure that the product performs exactly as it is intended to. The development environment's last step in the verification and validation process is testing. The method was successfully tested on 1500 Indian licence plates, and we discovered that 948 of those plates could be recognised exactly. However, it fell short in the remaining cases of the 552. Characters like M and N, P and R, 8 and B, and so on, were difficult to distinguish.

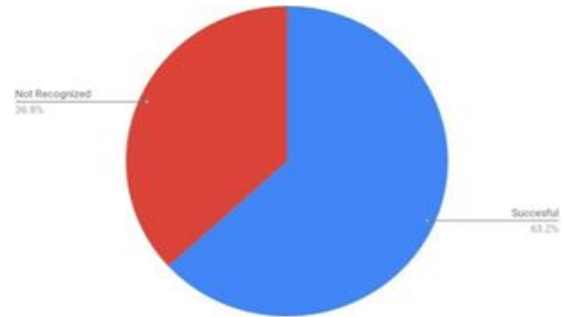


Fig 5: Test Analysis 1

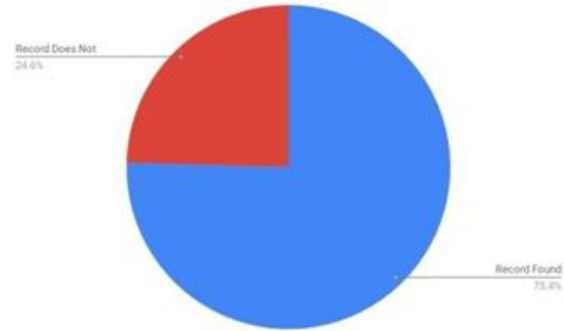


Fig 6:Test Analysis 2

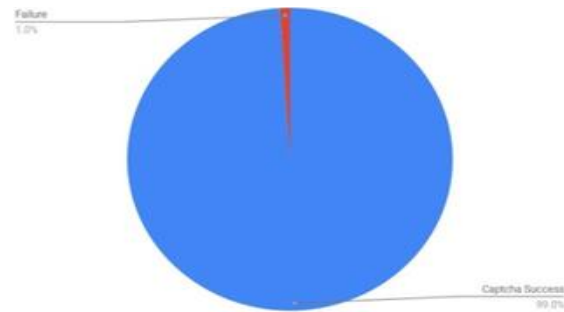


Fig 7: Test Analysis 3

948 successful number plate recognitions. Vahan.nic.in possessed information on 715 licence plates. The remaining 233 licence plates may be judged to be false or for which the government has no record. 73 licence plates were discovered to have inactive RC or to not have the necessary authorisation to be used.

The captcha evaluation was successful 99% of the time. At all of the provided test scenarios, the algorithm successfully found a solution. It demonstrates the weakness of official government websites.

This project uses automatic licence plate recognition to identify vehicles, where it has been shown that current methods don't focus much on reducing the system's power usage. As the goal of our proposed design is to reduce the system's power consumption, it

will play a crucial role in traffic management and security systems such as car theft prevention, parking lot management, etc. with the successful implementation of the same.

If this system is employed in real-time applications, high precision cameras can be used to boost overall accuracy, making the system more reliable. Additionally, a sensor can be made to enable the camera to only take pictures when necessary in order to conserve battery.

### VIII. CONCLUSION

This Project is based on automatic vehicle license plate recognition, in which it is observed that the existing techniques don't pay much attention towards improving the system's efficiency in terms of its power consumption. As the objective in our proposed design is to reduce power consumption of the system, with the successful implementation of the same it will play a very important role in traffic management and security systems such as automobile theft prevention, parking lot management etc. implementations of the software algorithm have shown promising results. The system can be made more robust if high precision cameras can be used to increase overall accuracy if this system is implemented in real time applications. Also a sensor can be designed to allow the camera to capture the image only when required to save power.

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