

# **NUMBER PLATE RECOGNITION IN BOTH IMAGE AND VIDEO USING PYTHON**

**Submitted in partial fulfillment of the requirements for the award of  
Bachelor of Engineering Degree in**

**Computer Science and Engineering**

**By**

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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING  
SCHOOL OF COMPUTING**

**SATHYABAMA  
INSTITUTE OF SCIENCE AND TECHNOLOGY (DEEMED TO BE UNIVERSITY)  
Accredited with Grade "A" by NAAC  
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**MARCH - 2021**



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(Established under Section 3 of UGC Act, 1956)

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

## BONAFIDE CERTIFICATE

This is to certify that this Professional Training Report is the bonafide work of **Monish K.B (Reg. No. 37110454)** and **NALLANI KAMALAKAR (Reg.no:37110487)** who underwent the professional training in “**NUMBER PLATE RECOGNITION IN BOTH IMAGE AND VIDEO USING PYTHON**” form February 2021 to May 2021.

Internal Guide

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## **DECLARATION**

We, **Monish K.B (Reg. No. 37110454)** and **NALLANI KAMALAKAR (Reg.no:37110487)** hereby declare that the professional Training Project Report **“NUMBER PLATE RECOGNITION IN BOTH IMAGE AND VIDEO USING PYTHON”** done by me under the guidance of **Dr.S.Prayla Shyry,M.E.,Ph.d.,** at Sathyabama institute of Science and Technology is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Computer Science and Engineering.

**DATE:**

**PLACE:**

**SIGNATURE OF THE CANDIDATE**

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## TRAINING CERTIFICATE



## **ABSTRACT**

Automatic number plate recognition is an image and video processing technology that uses a number (license) plate to identify the vehicle. The object is to design an automatic vehicle find system by vehicle number plate. The system is used on the entrance for the security gate of a highly not allowed area like the area around top government offices. Parliament, Court. The developed system created and first detected the vehicle and then captures the vehicle plate image. The vehicle number plate region is extracted using the image segmentation in an image. The optical character recognition technology is used for character recognition. The resulting information is then used to compare with the records on a database to come up with distinct information like the owner of the vehicle, place of registration, address. The system is implemented and simulated and its performance is tested on a real image. It is seen from the experiment that the developed system successfully captures and recognizes the vehicle number plate on real images.

# **CHAPTER 1**

## **INTRODUCTION**

Number-plate recognition is a technology that uses optical character recognition( OCR) on frames to read vehicle registration plates to have data and cameras specifically designed for the task. police forces around the world for law enforcement purposes, including to check if a vehicle is registered or Licensed It is also used for electronic toll gate collection onpay per use of roads and as a method of cataloguing the movements of traffic, for example by highways agencies . Number-plate recognition can be used to store the images captured by the cameras as well as the text from the license plate, with some configurable to store a photograph of the driver. configurable to store a photograph of the driver. Systems commonly use infrared lighting to allow the camera to take the picture at any time of day or night. Number-plate recognition technology must take into account plate variations from place to place. Privacy issues have caused concerns about Number-plate recognition, such as government tracking citizens movements, misidentification, high error rates, and increased government spending. Critics have described it as a form of mass surveillance.

We have created a custom function to feed Tesseract OCR the bounding box regions of license plates found by my custom YOLOv4 model in order to read and extract the license plate numbers. Thorough pre-processing is done on the license plate in order to correctly extract the license plate

number from the image. The function that is in charge of doing the pre-processing and text extraction is called recognize plate and can be found in the file utils.py

Most of the number plate localization algorithms merge several procedures, resulting in long computational time. The results are highly dependent on the image quality, since the reliability of the procedures severely degrades in the case of complex, noisy pictures that contain a lot of details. Unfortunately the various procedures barely offer remedy for this problem, precise camera adjustment is the only solution. This means that the car must be photographed in a way that the environment is excluded as possible and the size of the number plate is as big as possible. Adjustment of the size is especially difficult in the case of fast cars, since the optimum moment of exposure can hardly be guaranteed.

Number Plate Localization on the Basis of Edge Finding. The algorithms rely on the observation that number plates usually appear as high contrast areas in the image. First, the original car image in color is converted to black and white image which is called as grayscale image. After this stage, with help of Opencv numbers on number plate can be recognized.

Number Plate Recognition has been one of the useful approaches for vehicle surveillance. It can be applied at number of public places for fulfilling some of the purposes like traffic safety enforcement, automatic toll text collection , car park system and Automatic vehicle parking system. In automated systems, people utilize computer-based expert systems to analyze and handle real-life problems such as intelligent transportation systems. Presently number plate detection and recognition processing time is less than 50 milliseconds in many systems.

The escalating increase of contemporary urban and national road networks over the last decades emerged the need of efficient monitoring and management of road traffic. Meanwhile, rising vehicle use causes social problems such as accidents, traffic congestion, and consequent traffic pollution.

Real Time Number Plate Recognition is a process where vehicles are identified or recognized using their number plate or license plate by using image processing techniques so as to extract the vehicle number plate from digital images.

systems normally comprises of two components: A camera that used in capturing of vehicle number plate images, and software that extracts the number plates from the captured images by using a character

recognition tool that allows for pixels to be translated into numerical readable characters. It is used widely in various fields such as vehicle tracking, traffic monitoring, automatic payment of tolls on highways or bridges, Surveillance systems, tolls collection points, and parking management systems.

This algorithms are generally divided in four steps:

- (1) Vehicle image acquisition
- (2) Number plate extraction
- (3) Character segmentation and
- (4) Character recognition.

The first step to capture image of vehicle looks very easy but it is quite exigent task as it is very difficult to capture image of moving vehicle in real time in such a manner that none of the component of vehicle especially the vehicle number plate should be missed. The success of fourth step depends on how second and third step are able to locate vehicle number plate and separate each character.

## **CHAPTER 2**

### **AIM AND LITERATURE SURVEY**

#### **2.1 AIM :**

The aim of the project is to design an efficient automatic authorized vehicle identification system by using the vehicle number plate. So that we can identify text on number plate. So with help of this project we can reduce crime. We can install in toll gates and so many uses are there.

#### **2.2 GENERAL :**

This project is done by using python, open cv, tesseractV4. Number-plate recognition is a technology that uses optical character recognition on images to read vehicle registration plates to create vehicle location data. It can use existing closed-circuit television, road-rule enforcement cameras, or cameras specifically designed for the task. Number-plate recognition is used by police forces around the world for law enforcement purposes, including to check if a vehicle is registered or licensed. It is also used for electronic toll collection on pay-per-use roads and as a method of cataloguing the movements of traffic.

## **CHAPTER 3**

### **Methodology**

#### **3.1 HARDWARE REQUIREMENTS**

- System : I3 PROCESSOR
- Hard Disk : 300 GB.
- Monitor : 15 VGA Colour.
- Ram : 4 GB

#### **3.2 SOFTWARE REQUIREMENTS**

- Operating system : Windows 10
- Programming Language : python
- Application used : visual studio, Anaconda , Tesseractv4

### **3.3 OVERVIEW OF SOFTWARE REQUIREMENTS**

#### **HISTORY OF PYTHON :**

Python was conceived in the late 1980s, and its implementation began in December 1989 by “Guido van Rossum” at Centrum Wiskunde & Informatica (CWI) in the “ Netherlands “ as a successor to the ABC language capable of exception handling and interfacing with the Amoeba operating system.

Python 3.0 (initially called Python 3000 or py3k) was released on 3 December 2008 after a long testing period. It is a major revision of the language that is not completely backward-compatible with previous versions. However, many of its major features have been backported to the Python 2.6.x and 2.7.x version series, and releases of Python 3 include the 2 to3 utility, which automates the translation of Python 2 code to Python 3.

#### **FEATURES OF PYTHON**

Python is a dynamic, high level, free open source and interpreted programming language. It supports object-oriented programming as well as procedural oriented programming. Python is a multi-paradigm

programming language. and structured programming are fully supported, and many of its features support functional programming and aspect-oriented programming including by meta programming. Many other paradigms are supported via extensions, including design by contract and logic programming Python uses dynamic typing, and a combination of reference counting and a cycle-detecting garbage collector for memory management. It also features dynamic name re-resolution, which binds method and variable names during program execution .

## **OpenCV :**

OpenCV was started at Intel in 1999 by Gary Bradsky, and the first release came out in 2000. Vadim Pisarevsky joined Gary Bradsky to manage Intel's Russian software OpenCV team. In 2005, OpenCV was used on Stanley, the vehicle that won the 2005 DARPA Grand Challenge. Later, its active development continued under the support of Willow Garage with Gary Bradsky and Vadim Pisarevsky leading the project. OpenCV now supports a multitude of algorithms related to Computer Vision and Machine Learning and is expanding day by day. OpenCV supports a wide variety of programming languages such as C++, Python, Java, etc., and is available on different platforms including Windows, Linux, OS X, Android, and iOS. Interfaces for high-speed GPU operations based on CUDA and OpenCL are also under active development.

OpenCV-Python is the Python API for OpenCV, combining the best qualities of the OpenCV C++ API and the Python language. OpenCV-Python is a library of Python bindings designed to solve computer vision problems.

Python is a general purpose programming language started by Guido van Rossum that became very popular very quickly, mainly because of its simplicity and code readability. It enables the programmer to express ideas in fewer lines of code without reducing readability.

## **Methodology :**

This project consists of three main stages

- 1) Number Plate Localization
- 2) Character Segmentation
- 3) Optical Character Recognition (OCR).

- The Number Plate Localization stage is where the Number Plate is being detected.

- The Character Segmentation is second stage where each character from the detected Number Plate is segmented before recognition.
- In the last stage, characters are segmented from the Number Plate so that only useful information is retained for recognition where the image format converted into characters.

In this project to find number plate in a image we are using image segmentation method. After finding number plate we convert the colour image into grey mode. It is essential to convert the colour number plate into grey stage mode. So that we can convert the grey into black and white. After converting the number plate into grey colour then convert into black and white. So that system can easily understand the letters and numbers present in number plate. Now licence plate can be mapped out into individual images. This is called Character Segmentation.

### **image segmentation method :**

Digital image processing is the use of computer algorithms to perform image processing on digital images. Image segmentation is an important and challenging process of image processing. Image segmentation technique is used to partition an image into meaningful parts having similar features and properties. The main aim of segmentation is simplification i.e. representing an image into meaningful and easily analyzable way. Image segmentation is necessary first step in image analysis. The goal of image segmentation is to divide an image into

several parts/segments having similar features or attributes. The basic applications of image segmentation are: Content-based image retrieval, Medical imaging, Object detection and Recognition Tasks, Automatic traffic control systems and Video surveillance, etc.

There are several existing techniques which are used for image segmentation. These all techniques have their own importance. These all techniques can be approached from two basic approaches of segmentation. Those two are region based approach and edge based approach. For this project we have used edge based approach.

Character segmentation has long been a critical area of the OCR process. The higher recognition rates for isolated characters vs. those obtained for words and connected character strings well illustrate this fact. A good part of recent progress in reading unconstrained printed and written text may be ascribed to more insightful handling of segmentation. This paper provides a review of these advances. The aim is to provide an appreciation for the range of techniques that have been developed, rather than to simply list sources. Segmentation methods are listed under four main headings. What may be termed the "classical" approach consists of methods that partition the input image into subimages, which are then classified. The operation of attempting to decompose the image into classifiable units is called "dissection". The second class of methods avoids dissection, and segments the image either explicitly, by

classification of prespecified windows, or implicitly by classification of subsets of spatial features collected from the image as a whole. The third strategy is a hybrid of the first two, employing dissection together with recombination rules to define potential segments, but using classification to select from the range of admissible segmentation possibilities offered by these subimages. Finally, holistic approaches that avoid segmentation by recognizing entire character strings as units are described.

### **Optical character recognition**

Optical character recognition is the electronic or mechanical conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a scene-photo or from subtitle text superimposed on an image. Widely used as a form of data entry from printed paper data records – whether passport documents, invoices, bank statements, computerized receipts, business cards, mail, printouts of static-data, or any suitable documentation – it is a common method of digitizing printed texts so that they can be electronically edited, searched, stored more compactly, displayed on-line, and used in machine processes such as cognitive computing, machine translation, text-to-speech, key data and text mining.

OCR is a field of research in pattern recognition, artificial intelligence and computer vision. Early versions needed to be trained with images of each character, and worked on one font at a time. Advanced systems capable of producing a high degree of recognition accuracy for most fonts are now common, and with support for a variety of digital image file format inputs. Some systems are capable of reproducing formatted output that closely approximates the original page including images, columns, and other non-textual components.

### **YOLO algorithm:**

YOLO stands for You Only Look Once. YOLO is an effective real-time object recognition algorithm, first described in the seminal 2015 paper by Joseph Redmon et al. In this article we introduce the concept of object detection, the YOLO algorithm itself, and one of the algorithm's open source implementations. There are versions in yolo. Here we are using version 4.

Image classification is one of the many exciting applications of convolutional neural networks. Aside from simple image classification, there are plenty of fascinating problems in computer

vision, with object detection being one of the most interesting. It is commonly associated with self-driving cars where systems blend computer vision, LIDAR and other technologies to generate a multidimensional representation of the road with all its participants. Object detection is also commonly used in video surveillance, especially in crowd monitoring to prevent terrorist attacks, count people for general statistics or analyze customer experience with walking paths within shopping centers.

## **Object Detection Overview :**

There are several stages in Object Detection. Image Classification goes through levels of incremental complexity. Image classification , Object localization, Object detection.

Image classification aims at assigning an image to one of a number of different categories. Object localization then allows us to locate our object in the image . In a real real-life scenario, we need to go beyond locating just one object but rather multiple objects in one image. For example, a self-driving car has to find the location of other cars, traffic lights, signs, humans and to take appropriate action based on this information. Object detection provides the tools for doing just that – finding all the objects in an image and drawing the so-called bounding boxes around them. There are also some situations where we want to find exact boundaries of our objects in the process called instance segmentation.

## CHAPTER 5

### RESULTS AND DISCUSSION

Character segmentation is very important in order to perform character recognition with good amount of accuracy. Sometimes character recognition is not possible due to error in character segmentation. In some literature of NPR, character segmentation is not discussed with details. Some methods such as image binarization, CCA, vertical and horizontal projection can produce better results of character segmentation. It can detect and recognize vehicle plates from various distances. The distance affects the size of the number plate in an image. Once the vehicle number plate is detected, the individual characters are recognized using the OCR algorithm. The OCR use correlation method for the character recognition and the probability of the recognition can also be calculated. The system is computationally inexpensive and can also be implemented for real time vehicle identification system.

```

Anaconda Prompt (Anaconda3)
31-01-2021 16:32      674 commands.txt
31-01-2021 12:50      244 conda-cpu.yml
31-01-2021 12:50      288 conda-gpu.yml
31-01-2021 12:50    3,012 convert_tfllite.py
31-01-2021 12:50    4,254 convert_trt.py
31-01-2021 13:13 <DIR>      core
31-01-2021 13:08 <DIR>      data
31-01-2021 12:50    6,964 detect.py
31-01-2021 13:55 <DIR>      detections
31-01-2021 12:50    7,914 detect_video.py
31-01-2021 12:50    1,067 LICENSE
31-01-2021 12:50    2,478 license_plate_recognizer.py
31-01-2021 12:50   24,128 README.md
31-01-2021 12:50    113 requirements-gpu.txt
31-01-2021 12:50    109 requirements.txt
31-01-2021 12:50    2,662 save_model.py
      13 File(s)      53,907 bytes
      6 Dir(s) 120,519,839,744 bytes free

(base) E:\yolov4-custom-functions-master>conda env create -f conda-gpu.yml

CondaValueError: prefix already exists: C:\Users\MONISH K B\Anaconda3\envs\yolov4-gpu

(base) E:\yolov4-custom-functions-master>conda activate yolov4-gpu

(yolov4-gpu) E:\yolov4-custom-functions-master>python detect.py --weights ./checkpoints/custom-416 --size 416 --model yolov4 --images ./data/images/car10.jpg --plate
License Plate #:  GRNPL8

(yolov4-gpu) E:\yolov4-custom-functions-master>

```

Figure-1



Figure-2



Figure-3

## **CHAPTER 6**

### **CONCLUSION AND FUTURE WORK**

#### **CONCLUSION :**

This paper presents a recognition method in which the vehicle plate image and video is obtained by the digital cameras and the image is processed to get the number plate information. A rear image of a vehicle is captured and processed using various algorithms. A good image preprocessing almost guarantees a successful recognition. Further we are planning to study about the characteristics involved with the automatic number plate system for better performance. The implementation works quite well however, there is still room for improvement. The camera used in this project is sensitive to vibration and fast changing targets due to the long shutter time. The system robustness and speed can be increase if high resolution camera is used. The OCR methods used in this project for the recognition is sensitive to misalignment and to different sizes, the affine transformation can be used to improve the OCR recognition from different size and angles. The statistical analysis can also be used to define the probability of detection and recognition of the vehicle number plate.

## **Future work :**

NPR can be further exploited for vehicle owner identification, vehicle model identification traffic control, vehicle speed control and vehicle location tracking. It can be further extended as multilingual NPR to identify the language of characters automatically based on the training data. It can provide various benefits like traffic safety enforcement, security- in case of suspicious activity by vehicle, easy to use, immediate information. availability- as compare to searching vehicle owner registration details manually and cost effective for any country. For low resolution images some improvement algorithms like super resolution of images should be focused. Most of the NPR focus on processing one vehicle number plate but in real-time there can be more than one vehicle number plates while the images are being captured. In multiple vehicle number plate images are considered for NPR while in most of other systems offline images of vehicle.

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