KARNATAKA LAW SOCIETY'S

GOGTE INSTITUE OF TECHNOLOGY

UDYAMBAG, BELAGAVI – 590008

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

(APPROVED BY AICTE, NEW DELHI)

Course Activity Report

Number Plate Recognition of Vehicles

Submitted in the partial fulfillment for the academic requirement of

VI Semester B.E.

In

Artificial Intelligence and Machine Learning - Laboratory

Submitted by:

Naman Mehta	2GI18CS075
Parth Zanvar	2GI18CS085
Pragati Shetty	2GI18CS090

Under the Guidance of:

Dr. Umesh Kulkarni

Department of Computer Science and Engineering

KLS Gogte Institute of Technology, Belagavi

2020-2021

CERTIFICATE

This is to certify that the Seminar entitled “Number Plate Recognition of Vehicles” is a bona fide record of the Seminar work done by Naman Mehta (2GI18CS075), Parth Zanvar (2GI18CS085) and Pragati Shetty (2GI18CS090) under my supervision and guidance, in partial fulfillment of the requirements for the Outcome BasedEducation Paradigm in Computer Science and Engineering from Gogte Institute of Technology for the academic year 2020-2021.

Dr. Umesh Kulkarni
Asst. Professor
Computer Science and Engineering

Dr. Vijayraj Purohit
Professor and Head
Computer Science and Engineering

Place: KLS Gogte Institute of Technology
Date: 24 May 2021

Marks Allocation:

	Batch No. : 15					
1.	Project Title: Number plate recognition of vehicles	Marks Range	USN			
			2GI18CS 082	2GI18CS 083	2GI18CS 095	2GI18CS 102
2.	Problem statement (PO2)	0-1				
3.	Objectives of Defined Problem statement (PO1,PO2)	0-2				
4.	Design / Algorithm/Flowchart/Methodology (PO3)	0-3				
5.	Implementation details/Function/Procedures/Classes and Objects (Language/Tools) (PO1,PO3,PO4,PO5)	0-4				
6.	Working model of the final solution (PO3,PO12)	0-5				
7.	Report and Oral presentation skill (PO9,PO10)	0-5				
	Total	20				

*** 20 marks is converted to 10 marks for CGPA calculation**

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
3. **Design/Development of solutions:**Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:**Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:**Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

8. Individual and team work: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

8. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

8. Project management and finance: Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

ACKNOWLEDGEMENT

This group feels greatly indebted to Computer Science and Engineering Department, for the opportunity given us to undertake this “Number plate recognition of vehicles” Project. This Project includes thoughts and contribution of many individuals. And we wish to express our sincere appreciation and gratitude to them.

First and foremost, we want to extend entirely our gratitude to our lecturer Dr. Umesh Kulkarni for sharing his knowledge and profound wisdom with us. We appreciate all his comments and suggestions, which are incorporated into this project. We would also like to express our gratitude towards and group members. Without their help, support, and encouragement, this project would never had been completed.

In our respect, this project is an outcome of the learning experience we have shared with our fellow students. We dedicate this Project to all our fellow engineering students.

NAMAN MEHTA
PARTH ZANVAR
PRAGATI SHETTY

Contents

Abstract

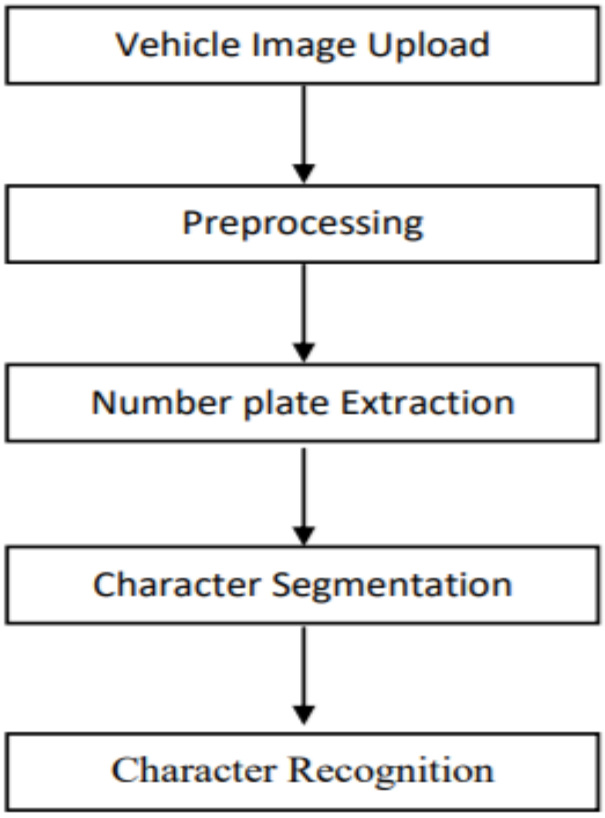
Vehicle number plate recognition plays a significant role in many areas. In this project, an efficient and an amazingly simple method is used to recognize the number plate. In the proposed method, Open CV library along with python language is used for image processing using py tesseract. The input image is taken and converted into grayscale image and the processed image is filtered through bilateral filter to remove unwanted characters. In this project, Canny edge detection method is used to detect the edges of license plate. TESSERACT is used as an Optical Character Recognition (OCR).

Introduction

Autonomous Vehicle Number Plate Detection is a part of digital image processing used to categorize the vehicle. This includes many applications such as, traffic violation control, tracing of stolen vehicles etc. In India, the number plate containing white background with black foreground color is used for private cars and for the commercial vehicles yellow is used as background and black as foreground color. The number plate starts with two-digit letter “state code” followed by two digit numeral, followed by two letter and a four digit unique number. Nowadays many vehicles are being stolen and sold to others illegally. This can be reduced by taking snapshots from the surveillance cameras around the city and also cameras is the toll booths. This 'photograph' is then fed in a computer system to find out details about the driver and owner of the vehicle and details about the vehicle itself. Noise on the number plate can sometimes cause error and low accuracy. There are some limitations that lead to failure in most practical applications due to the diversity of the number plate characteristics and the intricacy of the natural environment like rain, snow, for etc. we anticipated a method mainly based on edge detection and morphological operation and decrease the noise using mid-filtering noise removal method. The system for vehicle number plate detection includes a camera, a computer, and custom designed software for image processing, analysis and recognition.

Theory

Vehicle Number Plate Detection involves the following steps:



- **Input Raw Image** :Input the image of car that is taken from the camera or can be uploaded from the local system.

- **Grayscale conversion of image:** The image is in RGB format, RGB is converted to grayscalebecause processing a single channel image is faster than processing a three-channel coloured image.

- **Reduce noise:** Noise can create false edges, therefore before going further, it's imperative to perform image smoothening. Gaussian filter is used to perform this process.

- **Canny Edge Detector:** It computes gradient in all directions of our blurred image and traces the edges with large changes in intensity. For more explanation, please go through this article: Canny Edge Detector.

- **Region of Interest:** This step is to take into account only the region covered by the car plate, with the help of find contours method of openCV Furthermore, bitwise AND operation isperformed between each pixel of our canny image and this mask. It ultimately masks the canny image and shows the region of interest traced by the polygonal contour of the mask.

- **Plate localization:** The basic step in recognition of vehicle number plate is to detect the plate size. In general number plates are rectangular in shape. Hence identify the edges of the rectangular plate first. Mathematical morphology will be used to detect that region. Sobel edge detector is used to highlight regions with a high edge magnitude and high edge alteration are identified. Depending upon threshold value edge will be detected from the input image. After edge detection eliminates all connected components Thus it will produce another binary image.

- **Character segmentation and Recognition:** The image of the plate is passed as input to the Tesseract function which accepts image as a input and it processes the image and recognizes the text present in the image and return it back in string form.

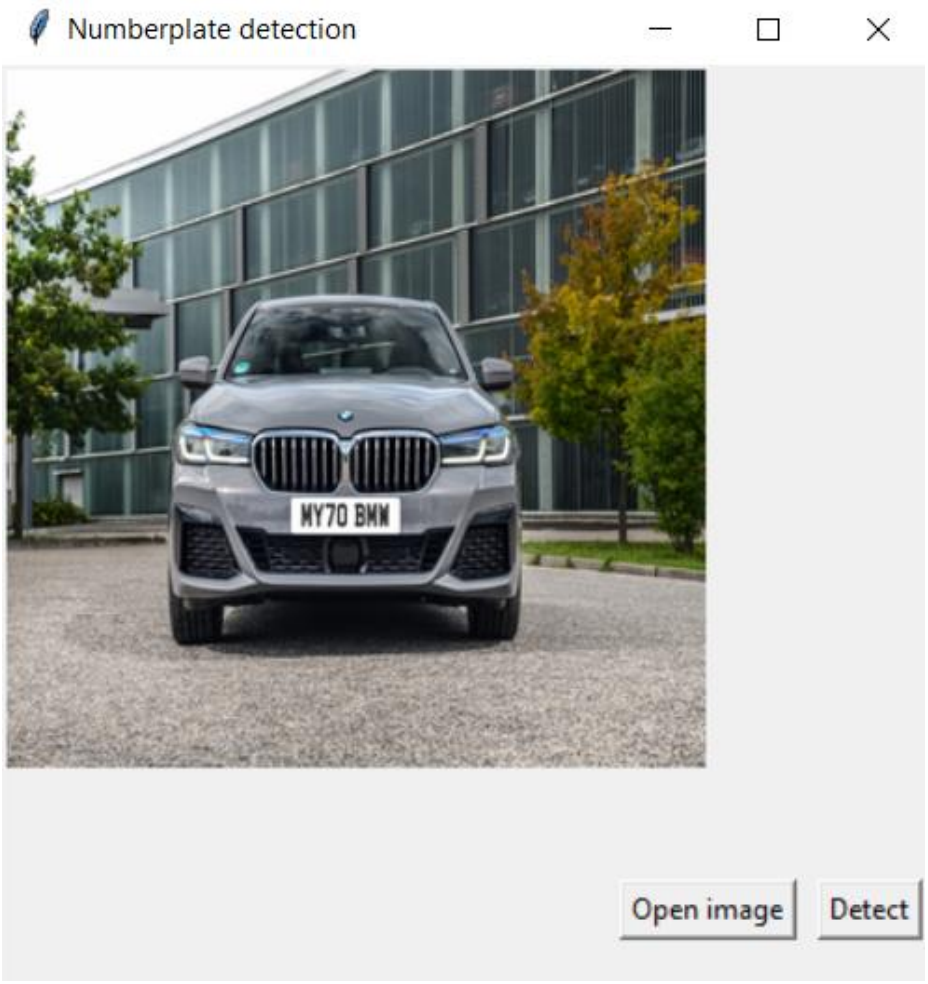
Program

```
import tkinter as tk
import cv2
import imutils
import pytesseract
from tkinter import filedialog
from PIL import ImageTk, Image

#This is for OCR. You will have to download Tesseract on your device.
#Refer to this page on how to download: https://github.com/tesseract-ocr/tesseract/wiki
#Once you download tesseract, you will have to place the path of the exe file below
pytesseract.pytesseract.tesseract_cmd = '../aiml/Tesseract-OCR/tesseract.exe'

#Function to open image and display it in the GUI
def open_img():
    x = openfilename()
    img = Image.open(x)
```

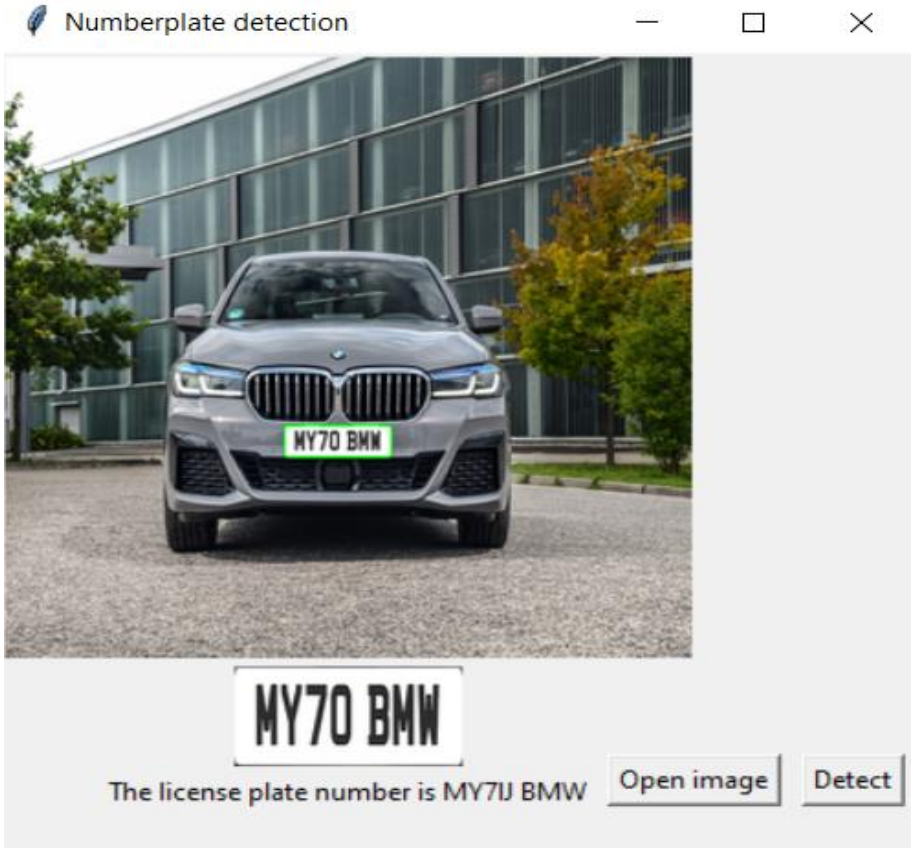
```
    img = img.resize((300,300), Image.ANTIALIAS)
    img = ImageTk.PhotoImage(img)
    panel = tk.Label(root, image=img)
    panel.image = img
    panel.grid(row=2)

#Function to open dialog box to open image
def openfilename():
    global filename
    filename = filedialog.askopenfilename(title="Select an image")
    return filename

def detect():
    img = cv2.imread(filename)
    tempImg=cv2.imread(filename)
    gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
    #A filter helps remove noise
    gray = cv2.bilateralFilter(gray, 17, 19, 19)
    edged = cv2.Canny(gray, 170, 200)
    cv2.imshow("Gray Image",gray)
    cv2.imshow("Edged Image",edged)
    contours, hierarchy = cv2.findContours(edged, cv2.RETR_CCOMP, cv2.CHAIN_APPROX_NONE)
    cv2.drawContours(tempImg, contours, -1, (0, 255, 0), 4)
    cv2.imshow("Dectected Objects in  Image",tempImg)
    rect = []
    #Detecting the rectangular contours
    for cnt in contours:
        approx = cv2.approxPolyDP(cnt, 0.02*cv2.arcLength(cnt, True), True)
        if len(approx) == 4:
            (x, y, w, h) = cv2.boundingRect(approx)
            if not (h>=0.95 and h<=1.05):
                rect.append(cnt)
    #Selecting the biggest rectangular contour which should be the numberplate
    maxCnt = max(rect,key=cv2.contourArea)
    (x, y, w, h) = cv2.boundingRect(maxCnt)
    #Cropping the image to extract only the numberplate
    plate = img[y:y+h, x:x+w, :]
    plate = cv2.cvtColor(plate, cv2.COLOR_BGR2RGB)
    #Extracting the numberplate details in the form of a string
    txt.set("The license plate number is " + get_text(plate))




    plate = Image.fromarray(plate)
    plate = plate.resize((100, 50), Image.ANTIALIAS)
    plate = ImageTk.PhotoImage(plate)
    #Updating the label to image with numberplate marked
    panel1 = tk.Label(root, image=plate)
    panel1.image = plate
    panel1.grid(row=3)
    #Marking the numberplate in the image
    cv2.drawContours(img, maxCnt, -1, (0, 255, 0), 4)
    img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
```

```
    res = Image.fromarray(img)
    res = res.resize((300,300), Image.ANTIALIAS)
    res = ImageTk.PhotoImage(res)
    panel2 = tk.Label(root, image=res)
    panel2.image = res
    panel2.grid(row=2)

#Function for OCR to extract numberplate details
def get_text(image):
    config = ('-l eng --oem 1 --psm 3')
    text = pytesseract.image_to_string(image, config=config)

    return text

#Main code
root = tk.Tk()
root.title("Numberplate detection")
root.geometry("400x400+30+30")
b1 = tk.Button(root, text="Open image", command=open_img).place(x = 265, y = 350)
b2 = tk.Button(root, text="Detect", command=detect).place(x = 350, y = 350)
txt = tk.StringVar()
panel3 = tk.Label(root, textvariable=txt)
panel3.grid(row=4)
root.mainloop()
```

Input :



Output



Conclusion

An efficient less time consuming vehicle number plate detection method is projected which performs Image Processing technique. The main aim of the study is to improve the performance of the system. By using OpenCV library we will be able to detect the number plate and characters in it. We have used python as our programming language which is a easy to read, learn and write. Our System is mainly based on Indian automobile number plates. Extraction of number plate accuracy may be increased for shallow ambient light image. Using these methods we can easily extract the character.

Reference

1. Ben Coppin, Artificial Intelligence Illuminated, Jones and Bartlett, 2004
2. Tom M. Mitchell, “Machine Learning”, Mcgraw-Hill Education (Indian Edition),2013.