Project on Automatic Number Plate Recognition System using Python

By

AISHWARYA.N

DEPARTMENT OF INFORMATION TECHNOLOGY

We would also like to thank all the teaching and non-teaching staffs of IT department, for their constant support and the encouragement given to us while we went about achieving our project goals.

TABLE OF CONTENTS

ABSTRACT

The main objective of the project is to monitor the vehicles that are entering and going out of the organization. All the vehicle must have their own unique license plate number, so the extraction of vehicles number plate plays a major role in this system. The vehicle number plate is captured by the camera which is placed in the entrance. The captured image is then processed by Automatic Number Plate Recognition (ANPR). This method is efficient way recognizing the vehicle number plate. A database is created with the vehicle number which are belongs to that particular organization. The recognized number plate is

then compared with the database and checks whether the vehicle belongs to organization or is it an unknown vehicle. Then the entry and exit time of the organization vehicles are recorded.

CHAPTER 1. INTRODUCTION:

All the vehicles have a unique vehicle identification number as their main identifier. The identifier is actually the license number that refers to a legal license to participate in the public movement. Each and every vehicle has its own unique number plate. For the identification of vehicle the number plate is common in all aspects.
The Organizations of all standards maintains a general system for their vehicle entry report. Most organizations keep a detailed report of the attendance issue.

Maintaining records of organization vehicles is a complicated task in manual process moreover it is difficult to generate reports when the usage of organization vehicles increases. The attendance of the organization vehicle is being taken by the security in the entrance. So for this our system will provide entry and exit time of the vehicle by automating it rather than doing manually, and also our system includes detection of unknown or outsider vehicles coming into the campus.

Automation is the most frequently spelled term in the recent days. Due to automation, revolution has occurred in the existing technologies. This system make use of an onboard computer, which is commonly termed as Raspberry Pi2 processor. It acts as heart of the project. This onboard computer can efficiently communicate with the output and input modules which are being used. The raspberry is connected to ultrasonic sensor, camera and a power supply is provided.

To identify the vehicle we use IR sensor or ultrasonic sensor which will be useful in detecting the vehicles coming into the organization. If the vehicle is nearing the sensor then it is triggered and activates the camera to capture the image automatically. The captured image undergoes image processing to recognize the vehicle number. The recognition of number plate involves steps such as 1) Image acquisition 2) Image preprocessing 3) Plate localization 4) Character segmentation 5) Character recognition. The database is created initially which contains the vehicle number belonging to the organization. Vehicles may belong to undergrads vehicles, staff vehicles, student vehicles their data are collected into the database.

The recognized vehicle number from the result of image processing is been compared with the existing database those number plate which are matched are stored in the database with their corresponding entry and exit and this data are authorized vehicle those number plate which are not matched will be maintained with unauthorized vehicle. This information will enable more security information and also provides with the regularly maintaining of the records. In most organization this process is almost maintained with security guards our system will provide automation rather than doing it in manual process.

CHAPTER 2. LITERATURE REVIEW

1.Paridhi Swaroop, **Neelam Sharma, "An Overview of Various Template Matching Methodologies in Image Processing", International Journal of Computer Applications (0975 – 8887)**

Volume 153 – No 10, November 2016

The following paper gives a comparison about applications and methods where template matching is used. Template is primarily a sub-part of an object that is to be matched amongst entirely different objects. The techniques of template matching are flexible and generally easy to make use of, that makes it one amongst the most famous strategies of object localization. Template matching is carried out in versatile fields like image processing, signal processing, video compression and pattern recognition. The following template matching techniques are used Naive Template Matching, Image Correlation Matching, Sum of Absolute Difference, sum of square difference.

2.Lucky Kodwani & Sukadev Meher "Automatic License Plate Recognition in Real Time Videos using Visual Surveillance Techniques "ISSN (PRINT): 2320 – 8945, Volume -1, Issue -6, 2013

This paper presents full-featured vehicle detection, tracking and license plate recognition system. It consists of vehicle detection, license plate extraction and a character recognition module. Here, first foreground estimation is done by Gaussian mixture model, then a real time and robust method of license plate extraction based on block variance technique is proposed. License plate extraction is an important stage in license plate recognition for automated transport system. The extracted license plates are segmented into individual characters by using a region-based approach.

The recognition scheme combines adaptive iterative thresholding with a template matching algorithm.

3.Riazul Islam, Kazi Fatima Sharif and Satyen Biswas, "Automatic Vehicle Number Plate Recognition Using Structured Elements", IEEE Conference on Systems, Process and Control December 2015, pp 44-48.

This research presents a prosperous method to identify vehicle number plates. The proposed technique is built on morphological operations based on different structuring elements in order to maximally exclude non-interested region and improve object area. This system has been experienced using a database of number plates and simulated results demonstrate major improvements as compared to other conventional systems.

4. Muhammad Tahir Qadri, Muhammad Asif "Automatic Number Plate Recognition System for Vehicle Identification using Optical Character Recognition" IEEE 2009

The objective is to design an efficient automatic authorized vehicle identification system by using the vehicle number plate. The system is implemented on the entrance for security control of a highly restricted area like military zones or area around top government offices e.g. Parliament, Supreme Court etc. The developed system first detects the vehicle and then captures the vehicle image. Vehicle number plate region is extracted using the image segmentation in an image. Optical character recognition technique is used for the character recognition. The resulting data is then used to compare with the records on a database so as to come up with the specific information like the vehicle's owner, place of registration, address, etc.

5.Aniruddh Puranic, Deepak K. T, Umadevi V "Vehicle Number Plate Recognition System: A Literature Review and Implementation using Template Matching" International Journal of Computer Applications (0975 – 8887) Volume 134 – No.1, January 2016

The growing affluence of urban India has made the ownership of vehicles a necessity. This has resulted in an unexpected civic problem - that of traffic control and vehicle identification. The Automatic Number Plate Recognition System (ANPR) plays an important role in addressing these issues as its application ranges

from parking admission to monitoring urban traffic and to tracking automobile thefts. There are numerous ANPR systems available today which are based on different methodologies. In this paper, we attempt to review the various techniques and their usage. The ANPR system has been implemented using template Matching and its accuracy was found to be 80.8% for number plates.

6.Byung-Gil Han, Jong Taek Lee, Kil-Taek Lim, and Yunsu Chung "Real-Time License Plate Detection in High Resolution Videos Using Fastest Available Cascade Classifier and Core Patterns" ETRI Journal, Volume 37, Number 2, April 2015

We present a novel method for real-time automatic license plate detection in high resolution videos. Although there have been extensive studies of license plate detection since the 1970s, the suggested approaches resulting from such studies have difficulties in processing high-resolution imagery in real-time. Herein, we propose a novel cascade structure, the fastest classifier available, by rejecting false positives most efficiently. Furthermore, we train the classifier using the core patterns of various types of license plates, improving both the computation load and the accuracy of license plate detection. To show its superiority, our approach is compared with other state-of-the-art approaches. In addition, we collected 20,000 images including license plates from real traffic scenes for comprehensive experiments. The results show that our proposed approach significantly reduces the computational load in comparison to the other state-of the-art approaches, with comparable performance accuracy.

7.Nighat Naaz Ansari, Ajay Kumar Singh "License Number Plate Recognition using Template Matching" International Journal of Computer Trends and Technology (IJCTT) – Volume 35 Number 4- May 2016

In this paper, recognition of characters written on a vehicle license number plate is proposed. Method used that is for the recognition of

the characters from the license number plate and is based on template-matching. In this method, first the image of a car license number plate is taken as input, then pre-processing steps such as conversion to Gray-scale image, dilation, erosion, convolution is done to remove noise from the input image. Then each character in the number plate is segmented. Segmentation is done on the basis of connected components. Then after segmentation, recognition of characters is done by matching templates to the segmented characters. Matching is done on the basis of correlation between segmented characters and the templates in the database. In the last step, a text file shows the recognized number and the character from the input image.

8.M. M. Shidore, S. P. Narote," Number Plate Recognition for Indian Vehicles" IJCSNS International Journal of Computer Science and Network Security, VOL.11 No.2, Feb. 2011

An algorithm for vehicle number plate extraction, character segmentation and recognition is presented. Database of the image consists of images with different size, background, illumination, camera angle, distance etc. The experimental results show that, number plates are extracted faithfully based on vertical edge detection and connected component algorithm, with the success rate of 85%. Character segmentation phase using connected component analysis and vertical projection analysis works well with the success rate of 80%. The success rate achieved for character recognition is 79.84%.

9.Automatic Number Plate Recognition:A Detailed Survey of Relevant Algorithms - Lubna , Naveed Mufti and Syed Afaq Ali Shah
Department of Telecommunication Engineering, University of Engineering and Technology, Peshawar - 2017

Abstract: Technologies and services towards smart-vehicles and Intelligent-Transportation-Systems (ITS), continues to revolutionize many aspects of human life. This paper presents a detailed survey of current techniques and advancements in Automatic-NumberPlate-Recognition (ANPR) systems,with a comprehensive performance comparison of various real-time tested and simulated algorithms, including those involving computer vision (CV). ANPR technology has the ability to detect and recognize vehicles by their number-plates using recognition techniques. Even with the best algorithms, a successful ANPR system deployment may require additional hardware to maximize its accuracy. The number plate condition, non-standardized formats, complex scenes, camera quality, camera mount position,tolerance to distortion, motion blur, contrast problems, reflections, processing and memory limitations, environmental conditions, indoor/outdoor or day/night shots, software-tools or other hardware-based constraint may undermine its performance. This inconsistency, challenging environments and other complexities make ANPR an interesting field for researchers. The Internet of-Things is beginning to shape future of many industries and is paving new ways for ITS. ANPR can be well utilized by integrating with RFID-systems, GPS, Android platforms and other similar technologies. Deep-Learning techniques are widely utilized in CV field for better detection rates. This research aims to advance the state-of-knowledge in ITS (ANPR) built on CV algorithms by citing relevant prior work, analyzing and presenting a survey of extraction, segmentation and recognition techniques whilst providing guidelines on future trends in this area.

10.Automatic License Plate Recognition (ALPR): A State-ofthe-Art Review - Shan Du; Mahmoud Ibrahim; Mohamed Shehata; Wael Badawy - IEEE Transactions on Circuits and Systems for Video Technology - 2018

Abstract:

Automatic license plate recognition (ALPR) is the extraction of vehicle license plate information from an image or a sequence of images. The extracted information can be used with or without a database in many applications, such as electronic payment systems (toll payment, parking fee payment), and freeway and arterial monitoring systems for traffic surveillance. The ALPR uses either a color, black and white, or infrared camera to take images. The quality of the acquired images is a major factor in the success of the ALPR. ALPR as a real-life application has to quickly and successfully process license plates under different environmental conditions, such as indoors, outdoors, day or night time. It should also be generalized to process license plates from different nations, provinces, or states. These plates usually contain different colors, are written in different languages, and use different fonts; some plates may have a single color background and others have background images. The license plates can be partially occluded by dirt, lighting, and towing accessories on the car. In this paper, we present a comprehensive review of the state-of-the-art techniques for ALPR. We categorize different ALPR techniques according to the features they used for each stage, and compare them in terms of pros, cons, recognition accuracy, and processing speed.

11. **Automated Sensing System for Real-Time Recognition of Trucks in River Dredging Areas Using Computer Vision and Convolutional Deep Learning** **by Jui-Sheng Chou and Chia-Hsuan Liu**

Department of Civil and Construction Engineering, National Taiwan University of Science and Technology, Taipei 106, Taiwan

Abstract

Sand theft or illegal mining in river dredging areas has been a problem in recent decades. For this reason, increasing the use of artificial intelligence in dredging areas, building automated monitoring systems, and reducing human involvement can effectively deter crime and lighten the workload of security guards. In this

investigation, a smart dredging construction site system was developed using automated techniques that were arranged to be suitable to various areas. The aim in the initial period of the smart dredging construction was to automate the audit work at the control point, which manages trucks in river dredging areas. Images of dump trucks entering the control point were captured using monitoring equipment in the construction area. The obtained images and the deep learning technique, YOLOv3, were used to detect the positions of the vehicle license plates. Framed images of the vehicle license plates were captured and were used as input in an image classification model, C-CNN-L3, to identify the number of characters on the license plate. Based on the classification results, the images of the vehicle license plates were transmitted to a text recognition model, R-CNN-L3, that corresponded to the characters of the license plate. Finally, the models of each stage were integrated into a realtime truck license plate recognition (TLPR) system; the single character recognition rate was 97.59%, the overall recognition rate was 93.73%, and the speed was 0.3271 s/image. The TLPR system reduces the labor force and time spent to identify the license plates, effectively reducing the probability of crime and increasing the transparency, automation, and efficiency of the frontline personnel's work. The TLPR is the first step toward an automated operation to manage trucks at the control point. The subsequent and ongoing development of system functions can advance dredging operations toward the goal of being a smart construction site. By intending to facilitate an intelligent and highly efficient management system of dredging-related departments by providing a vehicle LPR system, this paper forms a contribution to the current body of knowledge in the sense that it presents an objective approach for the TLPR system.

12.Imran Shafiq Ahmad, Boubakeur Boufama, Pejman Habashi, William Anderson, Tarik Elamsy - Automatic license plate recognition: A comparative study - International Symposium on Signal Processing and Information Technology IEEE 2015

Automatic license plate recognition (ALPR) is the process of locating and extracting vehicles plate information from images or videos. The extracted information is essential for several everyday applications, ranging from automated payment services (e.g. parking and toll roads payment collection) to more critical applications, like border crossing security and traffic surveillance systems. Various solutions have been proposed for the ALPR problem, with many available commercial packages. However, amid plate variations from place to place, ALPR systems tend to be region-specific. There is no general solution that works effectively everywhere for every province/state or country. In this paper, we have reviewed a set of state-of-the-art ALPR methods and, compared their respective performances by testing them on a rich database of vehicles from Ontario (Canada).

CHAPTER 3 - AIM AND SCOPE OF PRESENT INVESTIGATION

It is a process of collecting and interpreting facts, identifying the problems, and decomposition of a system into its components. System analysis is conducted for the purpose of studying a system or its parts in order to identify its objectives. It is a problem- solving technique that improves the system and ensures that all the components of the system work efficiently to accomplish their purpose. The objective of the system analysis activity is to develop structured system specification for the proposed system. The structured system specification should describe what the proposed system would do; independent of the technology, which will be used to implement these requirements. The structured system specification will be used

to implement these requirements. The essential model may itself consist of multiple models, modelling different aspect of the system. The data flow diagrams may model the data and their relationships and the state transition diagram may model time.

Problem Statement

First, it is necessary to locate and extract the license plate region from a larger scene image. Second, having a license plate region to work with, the alphanumeric characters in the plate need to be extracted from the background. Third, deliver them to an OCR system for recognition. In order to identify a vehicle by reading its license plate successfully, it is obviously necessary to locate the plate in the scene image provided by some acquisition system (e.g. video or still camera). Locating the region of interest helps in dramatically reducing both the computational expense and algorithm complexity. For example, a currently common 1024x768 resolution image contains a total of 786,432 pixels, while the region of interest (in this case a license plate) may account for only 10% of the image area. Also, the input to the following segmentation and recognition stages

should be simplified, resulting in easier algorithm design and shorter computation times.

Existing System

In the existing system number plates appear in different types of character styles, either single or double row, different sizes, spacing and character counts. Due to such kind of variations even localizing or detecting these plates becomes a tedious process. In the existing system, foreground estimation is done by Gaussian mixture model then proposing a real time and robust method of license plate extraction based on block variance technique. License plate extraction is an important stage in license plate recognition for automated transport system. The Extracted license plates are segmented into individual characters by using a region-based approach. The recognition scheme combines adaptive iterative thresholding with a template matching algorithm.

Disadvantages Of Existing System

- The existing method cannot work properly on degraded images with a complex background.
- Low accuracy.
- Noise content was high.
- They do not take into consideration of the noise or the image normalization in the input image.
- These methods do not show high contrast image for the output image.

- Manual assessment is subjective, time consuming and expensive
- In these methods, selection of features and classification strategy is difficult and challenging
- Poor and Inaccurate segmentation result

Proposed System

- This project is on the development of new approaches for extraction of license plates. The proposed algorithm is based on video acquisition, extraction of plate region, segmentation of plate characters and recognition of characters. Extraction of plate is a difficult task. In this project, a simple license plate extraction method is presented. The method is basically based on the Edge Detection algorithm including four major stages, which are RGB to gray-scale conversion, Gaussian Blurring, morphological operations and extracting the accurate location of the license plate. Mean squared error method is used for recognition of characters.
- In our framework we intended to screen what are the vehicles entering in to the school/college/office Premises and leaving the premises.We need screen this with both in time and out time and furthermore we need arrange that vehicle which are undergrads vehicles, staff vehicles and others vehicle by utilizing number plate in vehicle. In light of the order of vehicle it need to store in database.

CHAPTER 4. SYSTEM REQUIREMENTS AND SPECIFICATIONS

HARDWARE REQUIREMENTS

- Raspberry Pi-3
- Power Supply.(+5.1V micro USB supply)
- Ultrasonic/IR Sensor. (HC-SR 04)
- Servo motor. (Tower Pro SG90)
- Camera. (C525 Web cam)

SOFTWARE REQUIREMENTS

- Anaconda
  Python
- Raspbian
  OS

HARDWARE SPECIFICATIONS

This project makes use of an onboard computer, which is commonly termed as Raspberry Pi2 processor. It acts as heart of the project. This onboard computer can efficiently communicate with the output and input modules which are being used. The Raspberry pi is a credit-card sized single board computer which was firstly developed in UK by the Raspberry pi foundation.

Basically, the operating system for the detection of vehicle number plate using Raspberry pi is the Raspbian JC. For the recognition purpose, Raspberry pi model3 is used. Raspberry pi is a SOC (system on chip) device has inbuilt 1.2 GHz BCM 2837 Arm Cortex processor. The arm cortex processor is 64 bits. Raspberry pi has 1GB Ram. The overall average power is ranging from 1.5 to 6.7 watt. Raspberry pi has 40 digital input output pins in which 27 pins are GPIO (General Purpose Input Output).

It has operating system which is installed in external SD card for booting and long term storage. Here in this system raspberry pi is the heart of the project. The recognition of vehicle number plate is working in four steps. The first one is image acquisition, second is

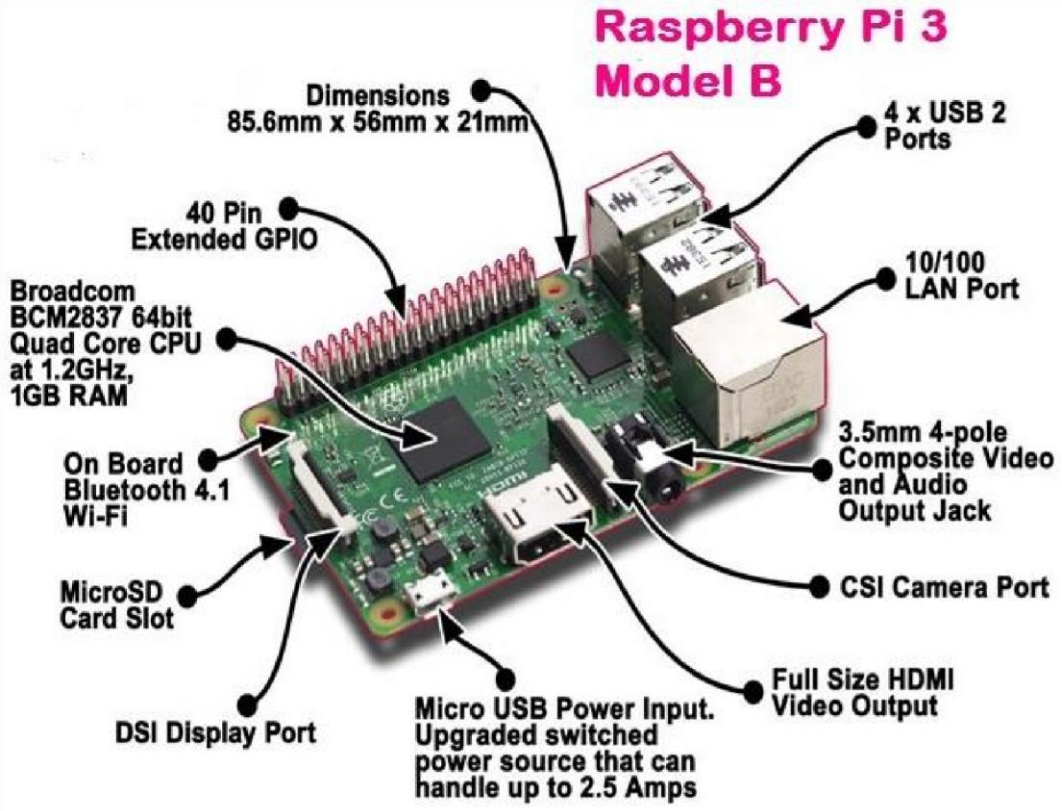
license plate extraction, third one is license plate segmentation, and last one is character recognition. OCR is the process which converts image into text. The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-device support.This block diagram describes Model B and B+; Model A, A+, and the Pi Zero are similar, but lack the Ethernet and USB hub components. The Ethernet adapter is internally connected to an additional USB port. In Model A, A+, and the Pi Zero, the USB port is connected directly to the system on a chip (SoC). On the Pi 1 Model B+ and later models the USB/Ethernet chip contains a five-port USB hub, of which four ports are available, while the Pi 1 Model B only provides two.

On the Pi Zero, the USB port is also connected directly to the SoC, but it uses a micro USB (OTG) port. Unlike all other Pi models, the 40 pin GPIO connector is omitted on the Pi Zero with solderable through holes only in the pin locations. The Pi Zero WH remedies this. All SoCs used in Raspberry Pis are custom-developed under collaboration of Broadcom and Raspberry Pi Foundation.

The Broadcom BCM2835 SoC used in the first generation RaspberryPi has distinct feature includes 700 MHz ARM1176JZF-S processor, VideoCore IV graphics processing unit (GPU),[27] and RAM. It has a level 1 (L1) cache of 16 KB and a level 2 (L2) cache of 128 KB. The level 2 cache is used primarily by the GPU. The SoC is stacked underneath the RAM chip, so only its edge is visible. The ARM1176JZ(F)-S is the same CPU used in the original iPhone, although at a higher clock rate, and mated with a much faster GPU. The earlier V1.1 model of the Raspberry Pi 2 used a Broadcom BCM2836 SoC with a 900 MHz 32-bit, quad-core ARM CortexA7 processor, with 256 KB shared L2 cache. The Raspberry Pi 2 V1.2 was upgraded to a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, the same SoC which is used on the Raspberry Pi 3, but underclocked (by default) to the same 900 MHz CPU clock speed as the V1.1. The BCM2836 SoC is no longer in production as of late 2016.The Raspberry Pi 3 Model B uses a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 KB shared L2 cache. The Model A+ and B+ are 1.4 GHz The Raspberry Pi 4 uses a Broadcom BCM2711

SoC with a 1.5 GHz 64-bit quadcore ARM Cortex-A72 processor, with 1MB shared L2 cache.

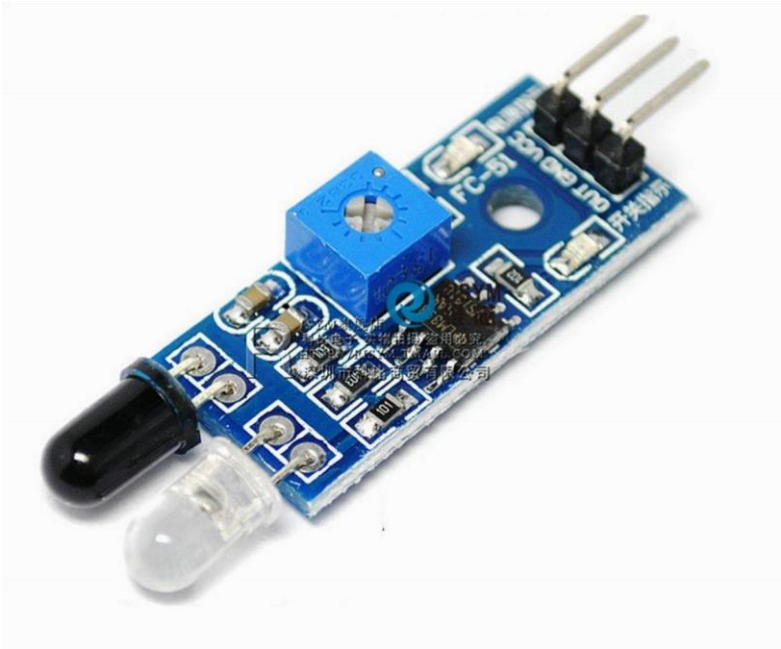
The Raspberry Pi Zero and Zero W use the same Broadcom BCM2835 SoC as the first generation Raspberry Pi, although now running at 1 GHz CPU clock speed


Raspberry Pi 3
Model B
Dimensions
85.6mm x 56mm x 21mm
4 x USB 2
Ports
40 Pin
Extended GPIO
10/100
LAN Port
Broadcom
BCM2837 64bit
Quad Core CPU
at 1.2GHz,
1GB RAM
3.5mm 4-pole
Composite Video
and Audio
Output Jack
On Board
Bluetooth 4.1
Wi-Fi
CSI Camera Port
MicroSD
Card Slot
Full Size HDMI
Video Output
DSI Display Port
Micro USB Power Input.
Upgraded switched
power source that can
handle up to 2.5 Amps

IR SENSOR

DESCRIPTION

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor.



SOFTWARE DESCRIPTION

RASPBIAN OS

Raspbian is a Debian-based (32 bit) computer operating system for Raspberry Pi. There are several versions of Raspbian including Raspbian Buster and Raspbian Stretch. Since 2015 it has been officially provided by the Raspberry Pi Foundation as the primary operating system for the family of Raspberry Pi single-board computers. Raspbian was created by Mike Thompson and Peter Green as an independent project. The initial build was completed in June

2012. The operating system is still under active development. Raspbian is highly optimized for the Raspberry Pi line's low-performance ARM CPUs.

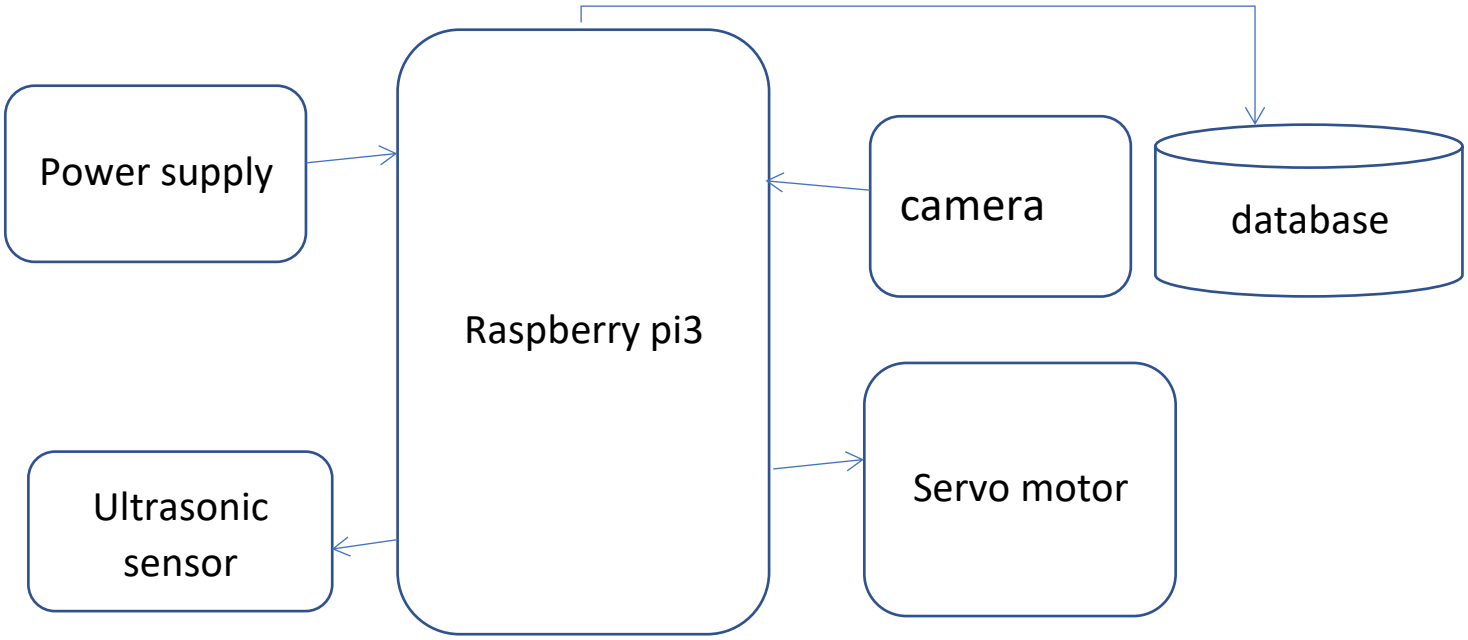
Raspbian uses PIXEL, **P**i **I**mproved **X**-Window **E**nvironment, **L**ightweight as its main desktop environment as of the latest update. It is composed of a modified LXDE desktop environment and the Openbox stacking window manager with a new theme and few other changes. The distribution is shipped with a copy of computer algebra program Mathematica and a version of Minecraft called Minecraft Pi as well as a lightweight version of Chromium as of the latest version.

CHAPTER 5.WORKING

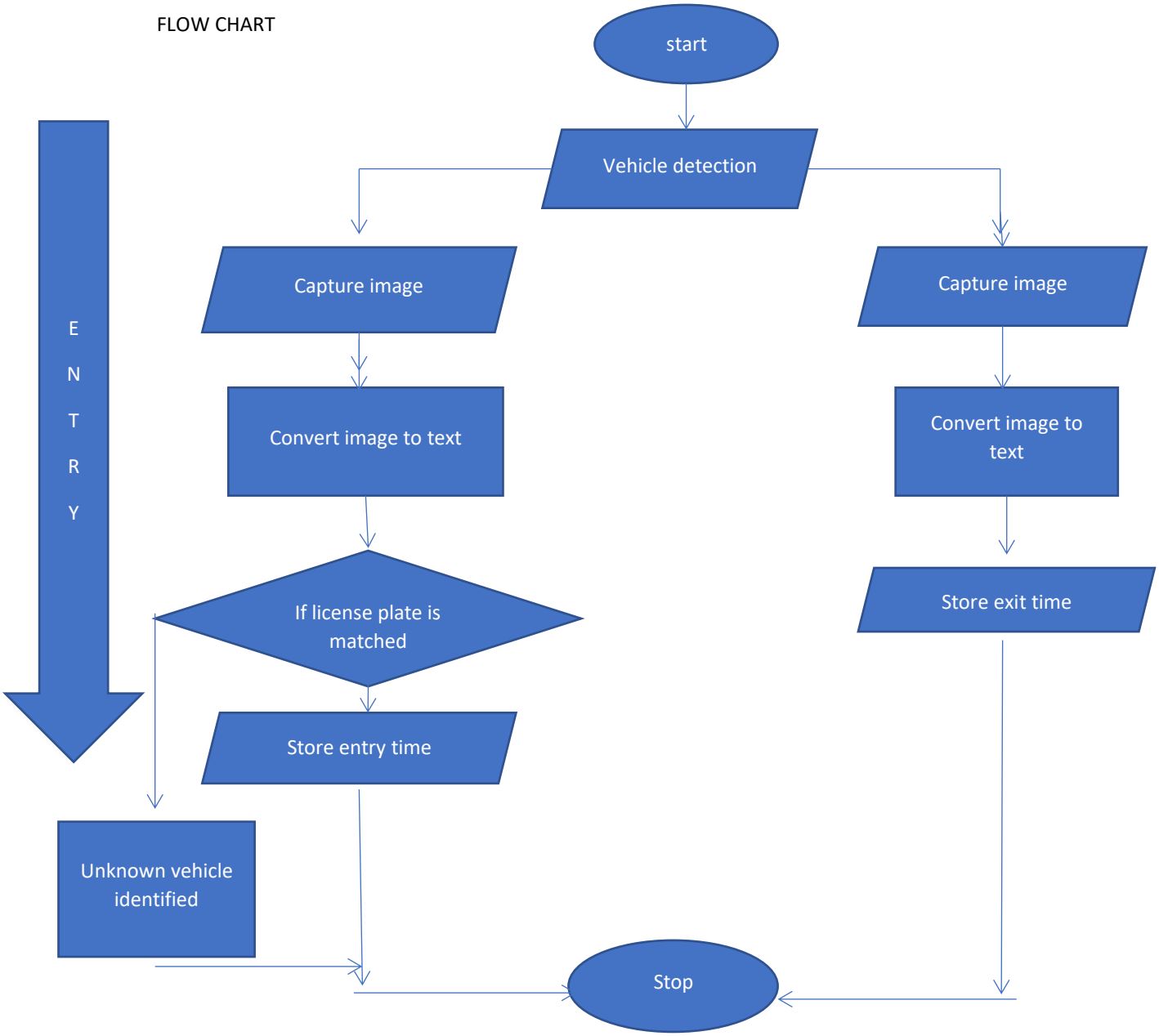
- A power supply of +5v is given to the raspberry pi.
- Ultrasonic sensor(HC-SR04) is placed at the entrance and it triggers the camera when a vehicle enters the organisation.
- Camera (Logitech C525) is used to capture the vehicle.
- Servo motor is used to change the angle of the camera to monitor both entry and exit of the vehicle.
- Raspberrypi 3 is used as the central processing unit and is used to process the captured image.

Finally the number plate is extracted and the entry and exit time is stored in the database

BLOCK DIAGRAM



Working Diagram



6.TECHNIQUES USED

ANPR system has five steps

- Image Acquisition
- Image pre-processing
- Number Plate extraction
- Character segmentation
- Character recognition

A. IMAGE ACQUISITION

Image Acquisition means getting an image from the digital camera or mobile camera. Images are taken in various frames and lighting situations. Distance factor, atmospheric states (winter, smog, rainfall, summer) are obligated for "noise" at the time of taking photographs. These images are in RGB format.

B. Image Pre-processing

The objective of pre-processing is obtaining an estimated image and eliminates the distortions. RGB image is transform into Gray Scale. After pre-processing filter method is used. There are different filter method exists but median filter is used mostly.

C. Plate Extraction

The image acquired after pre-processing have irrelevant part. The unwanted region needs to be removed. There are various techniques for plate extraction. Edge detection is the most familiar approach for plate extraction. There are many edge detection techniques like sobel edge detection, Roberts edge detection.

D. Character Segmentation:

The objective of character segmentation method is to separate each letter and extract the character and left the other unwanted components. The use of this method is to decide the outline of character in image. There are various technique of character segmentation namely

- Vertical and horizontal scanning method
- Region props function using MATLAB
- Character segmentation method using the number of alternating white and black
- Projection profile method

E. Character recognition*:*

Character recognition step identifies the features of the character. OCR and template matching are used by many researchers. Optical Character Recognition (OCR) means extract feature of character from image. Template matching is a character recognition technique. This method finds similarity between input and output image and show similar image.

7.CODING

SOURCE CODE

```
import tkinter as tk from tkinter
import filedialog from tkinter
```

```
import * from PIL import
ImageTk, Image from tkinter
import PhotoImage import
numpy as np import cv2 import
pytesseract as tess def
clean2_plate(plate):
   gray_img = cv2.cvtColor(plate, cv2.COLOR_BGR2GRAY)

   _, thresh = cv2.threshold(gray_img, 110, 255, cv2.THRESH_BINARY)
num_contours,hierarchy =
cv2.findContours(thresh.copy(),cv2.RETR_EXTERNAL,
cv2.CHAIN_APPROX_NONE)

   if num_contours:        contour_area = [cv2.contourArea(c) for
c in num_contours]        max_cntr_index =
np.argmax(contour_area)

      max_cnt = num_contours[max_cntr_index]
max_cntArea = contour_area[max_cntr_index]        x,y,w,h
= cv2.boundingRect(max_cnt)

      if not ratioCheck(max_cntArea,w,h):
         return plate,None

      final_img = thresh[y:y+h, x:x+w]
      return final_img,[x,y,w,h]

   else:
      return plate,None

def ratioCheck(area, width, height):
ratio = float(width) / float(height)     if
ratio < 1:
      ratio = 1 / ratio     if (area < 1063.62 or area > 73862.5) or
(ratio < 3 or ratio > 6):
      return False
return True
```

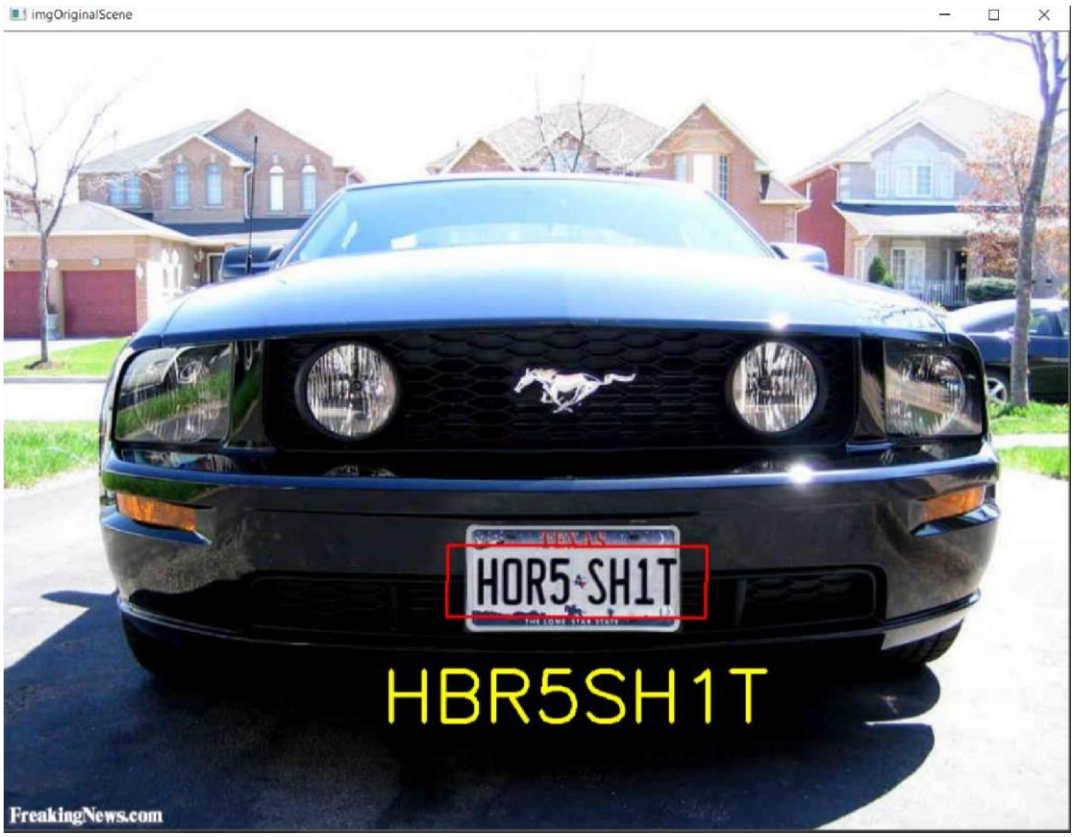
```
def isMaxWhite(plate):
avg = np.mean(plate)
if(avg>=115):
return True     else:
return False

def ratio_and_rotation(rect):
   (x, y), (width, height), rect_angle = rect

   if(width>height):
      angle = -rect_angle
else:
      angle = 90 + rect_angle

   if angle>15:
return False

   if height == 0 or width == 0:
      return False

   area = height*width     if not
ratioCheck(area,width,height):
      return False
else:
      return True

top=tk.Tk() top.geometry('900x700')
top.title('Number Plate Recognition')
top.iconphoto(True, PhotoImage(file="/home/abc /Dataflair/Test
Project_CIFAR/GUI/logo.png"))
img = ImageTk.PhotoImage(Image.open("logo.png"))
top.configure(background='#CDCDCD')
label=Label(top,background='#CDCDCD', font=('arial',35,'bold'))
# label.grid(row=0,column=1)
sign_image = Label(top,bd=10)
plate_image=Label(top,bd=10)
def classify(file_path):
res_text=[0]     res_img=[0]
```

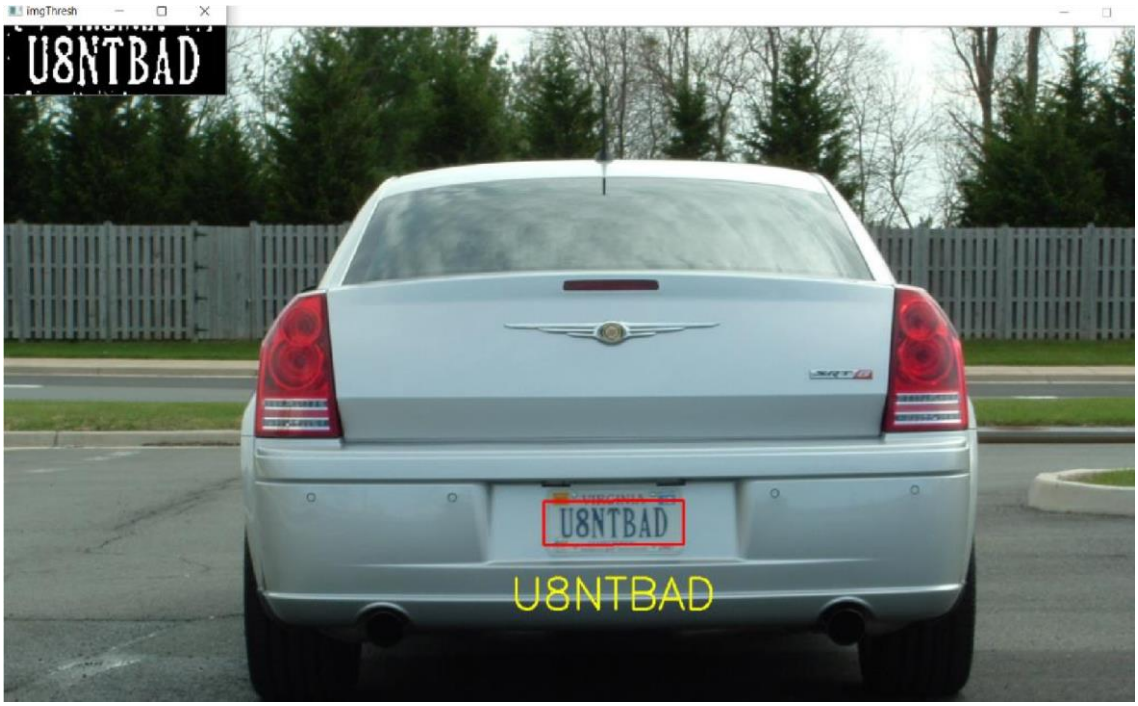
```
   img = cv2.imread(file_path)     img2 =
cv2.GaussianBlur(img, (3,3), 0)
   img2 = cv2.cvtColor(img2, cv2.COLOR_BGR2GRAY)

   img2 = cv2.Sobel(img2,cv2.CV_8U,1,0,ksize=3)
   _,img2 = cv2.threshold(img2,0,255,cv2.THRESH_BINARY+cv2.THRESH_OTSU)

  element = cv2.getStructuringElement(shape=cv2.MORPH_RECT, ksize=(17, 3))
morph_img_threshold = img2.copy()
   cv2.morphologyEx(src=img2, op=cv2.MORPH_CLOSE, kernel=element,
dst=morph_img_threshold)     num_contours, hierarchy=
cv2.findContours(morph_img_threshold,mode=cv2.RETR_EXTERNAL,method=c
v2.CHAIN_APPROX_NONE)
   cv2.drawContours(img2, num_contours, -1, (0,255,0), 1)


   for i,cnt in enumerate(num_contours):

      min_rect = cv2.minAreaRect(cnt)

      if ratio_and_rotation(min_rect):

         x,y,w,h = cv2.boundingRect(cnt)
plate_img = img[y:y+h,x:x+w]
         print("Number  identified number plate...")
res_img[0]=plate_img           cv2.imwrite("result.png",plate_img)
if(isMaxWhite(plate_img)):
            clean_plate, rect = clean2_plate(plate_img)

if rect:
fg=0
               x1,y1,w1,h1 = rect
               x,y,w,h = x+x1,y+y1,w1,h1
               plate_im = Image.fromarray(clean_plate)
text = tess.image_to_string(plate_im, lang='eng')
res_text[0]=text                  if text:                     break
   label.configure(foreground='#011638', text=res_text[0])
```

```
   uploaded=Image.open("result.png")
im=ImageTk.PhotoImage(uploaded)
plate_image.configure(image=im)     plate_image.image=im
plate_image.pack()     plate_image.place(x=560,y=320) def
show_classify_button(file_path):
classify_b=Button(top,text="Classify Image",command=lambda:
classify(file_path),padx=10,pady=5)
classify_b.configure(background='#364156',
foreground='white',font=('arial',15,'bold'))
classify_b.place(x=490,y=550) def upload_image():     try:
      file_path=filedialog.askopenfilename()
uploaded=Image.open(file_path)
      uploaded.thumbnail(((top.winfo_width()/2.25),(top.winfo_height()/2.25)))
im=ImageTk.PhotoImage(uploaded)        sign_image.configure(image=im)
sign_image.image=im        label.configure(text='')
show_classify_button(file_path)     except:        pass
upload=Button(top,text="Upload an
image",command=upload_image,padx=10,pady=5)
upload.configure(background='#364156', foreground='white',font=('arial',15,'bold'))
upload.pack()
upload.place(x=210,y=550)

sign_image.pack()
sign_image.place(x=70,y=200)


label.pack()
label.place(x=500,y=220) heading
= Label(top,image=img)
heading.configure(background='#CDCDCD',foreground='#364156')
heading.pack() top.mainloop()
```

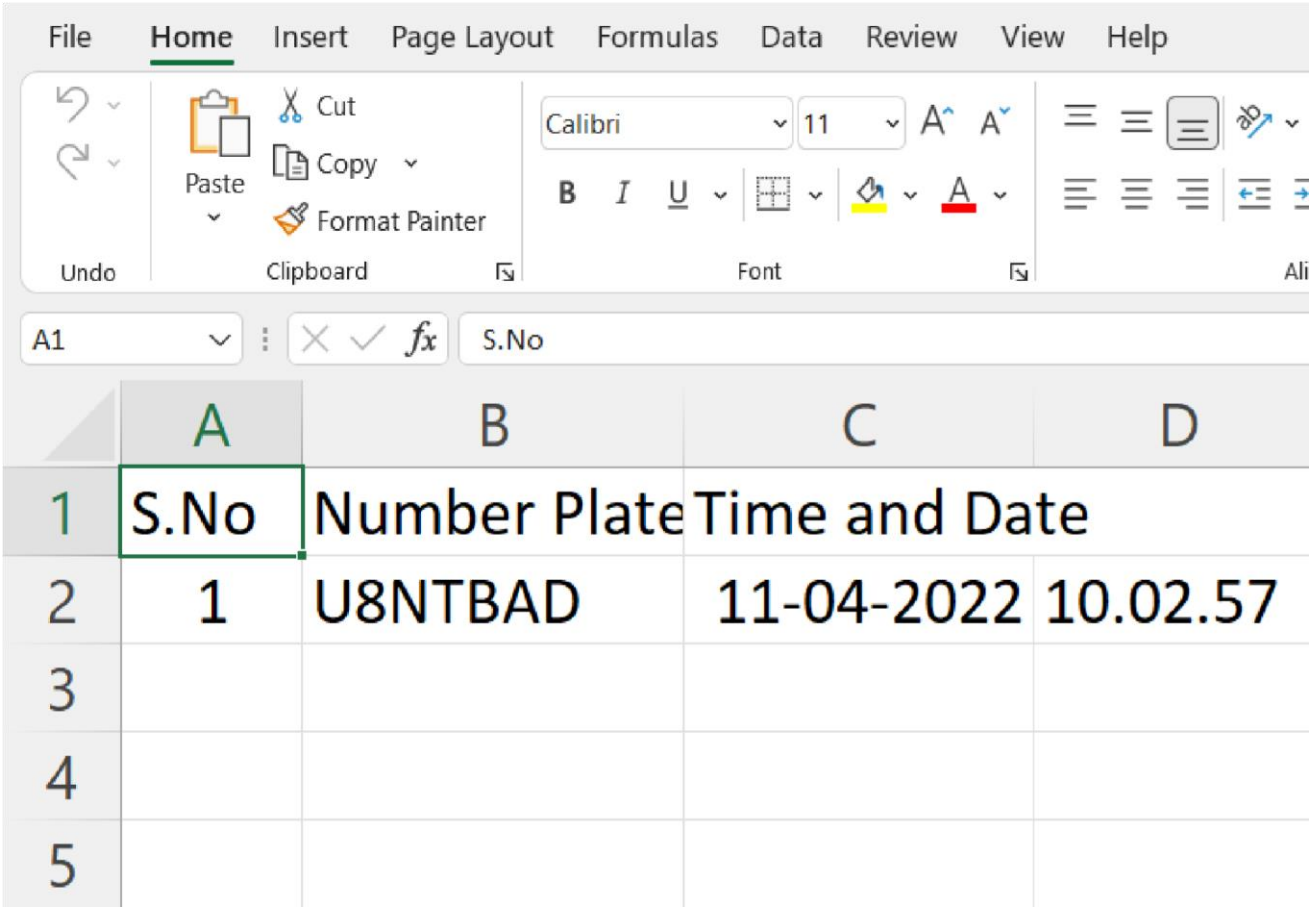
Note : `top.iconphoto(True, PhotoImage(file="/home/abc /Dataflair/Test Project_CIFAR/GUI/logo.png"))`
in the above line the test image is inserted and the output is derived

8. Output image





OUTPUT



	A	B	C	D
1	S.No	Number Plate	Time and Date	
2	1	U8NTBAD	11-04-2022	10.02.57
3				
4				
5				

9. CONCLUSIONS AND FUTURE SCOPE

CONCLUSION

- ANPR applications are becoming increasingly complex in Indian context with the phenomenal exponential growth in car, two-wheeler and auto Industries. ANPR applications like automatic toll collection, automatic charging system in parking spaces, management vehicles in parking spaces, and traffic monitoring, etc., have posed new research tasks in ANPR with newer dimensions.
- This system can be widely used among the gated communities and other organizations in order to monitor their campus vehicle and to show their exact status of their campus vehicles.

LIMITATIONS

- Camera should be of good quality. Otherwise, correct text from image would not be extracted properly.
- There should be proper lighting.
- This system does not respond properly under different illumination conditions.
- Although accuracy is high, mean squared error leads to low computational results

FUTURE SCOPE

- The implementation of the proposed system can be extended for the recognition of number plates of multiple vehicles in a single image frame. User friendly android applications can be developed for traffic surveillance management systems. Also, character recognition can be done using various deep learning algorithms as they yield more accuracy. GPUs can be used to achieve more performance in terms of computational time.
- If it can be made concise then it can also be fitted in police cruisers and other law enforcement division vehicles to make the world a more safer place.

BIBILOGRAPHY

1.Paridhi Swaroop, Neelam Sharma, “An Overview of Various Template Matching Methodologies in Image Processing”, International Journal of Computer Applications (0975 – 8887) Volume 153 – No 10, November 2016

2.Lucky Kodwani & Sukadev Meher “Automatic License Plate Recognition in Real Time Videos using Visual Surveillance Techniques “ISSN (PRINT): 2320 – 8945, Volume -1, Issue -6, 2013

3.Riazul Islam, Kazi Fatima Sharif and Satyen Biswas, “Automatic Vehicle Number Plate Recognition Using Structured Elements”, IEEE Conference on Systems, Process and Control December 2015, pp 44-48.

4. Muhammad Tahir Qadri, Muhammad Asif “Automatic Number Plate Recognition System for Vehicle Identification using Optical Character Recognition” IEEE 2009

5.Aniruddh Puranic, Deepak K. T, Umadevi V “Vehicle Number Plate Recognition System: A Literature Review and Implementation using Template Matching” International Journal of Computer Applications (0975 – 8887) Volume 134 – No.1, January 2016

6.Byung-Gil Han, Jong Taek Lee, Kil-Taek Lim, and Yunsu Chung “Real-Time License Plate Detection in High Resolution Videos Using Fastest Available Cascade Classifier and Core Patterns” ETRI Journal, Volume 37, Number 2, April 2015

7.Nighat Naaz Ansari, Ajay Kumar Singh “License Number Plate

Recognition using Template Matching" International Journal of Computer Trends and Technology (IJCTT) – May 2016

8.M. M. Shidore, S. P. Narote," Number Plate Recognition for Indian Vehicles" IJCSNS International Journal of Computer Science and Network Security, VOL.11 No.2, Feb. 2011

9.Automatic Number Plate Recognition:A Detailed Survey of Relevant Algorithms - Lubna , Naveed Mufti and Syed Afaq Ali Shah - Department of Telecommunication Engineering, University of Engineering and Technology, Peshawar - 2017

10.Automatic License Plate Recognition (ALPR): A State-of-the Art Review - Shan Du; Mahmoud Ibrahim; Mohamed Shehata; Wael Badawy - IEEE Transactions on Circuits and Systems for Video Technology - 2018

11. Automated Sensing System for Real-Time Recognition of Trucks in River Dredging Areas Using Computer Vision and Convolutional Deep Learning by Jui-Sheng Chou and ChiaHsuan Liu - Department of Civil and Construction Engineering, National Taiwan University of Science and Technology, Taipei 106, Taiwan

12.Imran Shafiq Ahmad, Boubakeur Boufama, Pejman Habashi, William Anderson, Tarik Elamsy - Automatic license plate recognition: A comparative study - International Symposium on Signal Processing and Information Technology IEEE 2015