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Vehicle Number Plate Recognition Using MATLAB

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Abstract: ***The Number plate Recognition system is based on image processing technology. It is one of the necessary systems designed to detect the vehicle number plate. In today's world with the increasing number of vehicle day by day it's not possible to manually keep a record of the entire vehicle. With the development of this system it becomes easy to keep are cord and use it whenever required.***

I. INTRODUCTION

With increasing number of vehicles on roads, it is getting difficult to manually enforce laws and traffic rules for smooth traffic flow. Toll-booths are constructed on freeways and parking structures, where the car has to stop to pay the toll or parking fees. Also, Traffic Management systems are installed on freeways to check for vehicles moving at speeds not permitted by law. All these processes have a scope of improvement. In the center of all these systems lies a vehicle. In order to automate these processes and make them more effective, a system is required to easily identify a vehicle. The important question here is how to identify a particular vehicle. The obvious answer to this question is by using the vehicle's number plate.

1.1Purpose of this project

The main purpose of this project is to detect a number plate from an image provided by a camera. An efficient algorithm is developed to detect a number plate in various luminance conditions. This algorithm extracts the number plate data from an image and provides it as an input to the stage of Car Number Plate Recognition. The image of a vehicle is given as an input fromthe camera. Extracted image of the number plate can be seen on television forverificationpurpose.

Some protocol developed previously will be discussed in this section. Asignificant amount of work has been done over the last couple of years onimage processing technique and deep learning for object detection purpose.Several different recognition and detection algorithms for vehiclereconnaissance have evolved in this field. We can see different currenttechniquesoccurringfromliteraturereview

1.2 SignificanceofthisProject

A vehicle registration plate, also known as a number plate (British English),license plate (American English), or license plate (Canadian English), is ametal or plastic plate attached to a motor vehicle or trailer for officialidentification purposes. All countries require registration plates for roadvehicles such as cars, trucks, and motorcycles. Whether they are required forother vehicles, such as bicycles, boats, or tractors, may vary by jurisdiction.The registration identifier is a numeric or alphanumeric ID that uniquelyidentifies the vehicle or vehicle owner within the issuing region's vehicleregister. In some countries, the identifier is unique within the entire country,while in others it is unique within a state or province. Whether the identifier isassociated with a vehicle or a person also varies by issuing agency. There arealso electronic license plates. In the vast majority of jurisdictions, thegovernmentholds amonopolyonthemanufacturingofvehicleregistration

1.3 Fundamental of Image Processing

Animageisusedtoconveyusefulinformationinavisibleformat.Animageis nothing but an arrangement of tiny elements in a two-dimensional plane.These tiny elements are called Pixels. A large number of pixels combinetogethertoformanimage,whethersmallorlarge.

Each pixel represents certain information about the image, like color, lightintensity and luminance. A large number of such pixels combine together toform an image. Pixel is the basic element used to describe an image. Mostly,each pixel in an image is represented in either RGB (Red Green Blue) formator YCbCr format. In case of an RGB image, all the three components, namelyR, G and B combine together to convey information about the color andbrightness of a single pixel. Each component consumes certain memory spaceduringimageprocessing.

- **RGBFormat**

IncaseofanRGBimage,eachpixelisrepresentedbythreedifferentcomponents R, G and B. Each of these components requires at least 8 bits fortheir storage. In general, a single pixel may require upto 8 * 3 bits for itsstorage.
ThevalueofR,GandB eachrangesfrom0-255.Avalueof(0,0,0)represents a black pixel, (255, 0, 0) represents a red pixel and (0, 255, 0)represents a green pixel. So, 8 bits are required to store value for a singlecomponent.

- **YCbCrFormat**

The methodology section outline the plan and method that how the study is conducted. This includes Universe of the study, sample of the study,Data and Sources of Data, study's variables and analytical framework.

2 Methodology

Theworkingoffull NPRsystemcanbedividedintotwobroadsections.

- Hardwarepart
- Softwarepart

Software Model: The first and the most important part in this process isthesoftwaremodel.Thesoftwaremodelusestheimageprocessingtechnology.TheprogramsareimplementedinMATLAB.The algorithmisdividedintofollowingparts:Captureimage,Pre-processing,Plateregion extraction, Segmentation of character in the extracted number plate,Character recognition, Comparison with databaseand Indicate result. Theflowchartofnumberplaterecognitionsystemimplementationinthiswork is shown in the following figure. There are various steps in thisapproachand these areimplementation inMATLAB.

2.1Hardware Model

: The hardwaremodelconsistsmicrocontrollerforcontrolling the complete hardware of the ANPR system. The ANPR algorithmon a PC receives the image and performs the processing, which Yields thevehiclenumber.ThisNumberisthencomparedtostandarddatabaseandfinallyprovidessignaltomicrocontrollertocontrolthes ystemHardware.Iftheinputted plate contains the authorized number then the green indication lightwill be switched on w, and if the inputted plate contains an unauthorizednumberthenredindicationwillbeswitched-on

2.2WORKFLOWPROCESS

Capture of Image: The first step is the capture of image. The image iscapturedbyelectronicdevice.DigitalCameraorWebcam.Theimagecaptured is stored in JPEG format. Later on it is converted in to gray scaleimageinMATLAB.

Pre-processing:Thenextstepaftercapturingtheimageisthepreprocessingoftheimage.Whentheimageiscapturedthereislotofdistur bances and noises present in the image for which the image can't beused properly. So in this step the noises from the image are required to beclearedtoobtain anaccurate result.

Gray Processing: this step involves the conversion of image in toGray levels. Color images are converted in to Gray image. Accordingto the R, G, B value in the image, it calculates the value of gray value,andobtainsthe grayimage atthesame time.
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Median Filtering: media filtering is the step to remove the noisesfrom the image. Gray level cannot remove the noises. So to makeimagefree from noisemedia filtering isused.

Plateregionextraction:Themostimportantstageistheextractionofnumberplatefromerodedimagesignificantly.Theextractio ncanbedonebyusingimagesegmentationmethod.Therearenumerousimagesegmentationmethodsavailableinvariousliterature s.Inmostofthemethodsimagebinarizationisused.
rate and stock returns. Nguyen (2010) studies Thailand market and found thatInterest rate has aninverse relationship with stock prices.

It requires the re-registration of any vehicle that crossesits borders from another country, such as for overland tourist visits, regardlessof the length of time it is due to remain there; this has to be arranged with priorapproval. Other jurisdictions follow a "plate-to-owner" policy, meaning thatwhenavehicleissoldthesellerremovesthecurrentplatefromthevehicle.
Buyers must either obtain new plates or attach plates they already hold, as wellas register their vehicles under the buyer's name and plate number. A personwho sells a car and then purchases a new one can apply to have the old platesput onto the new car. One who sells a car and does not buy a new one may,depending on the local laws involved, have to turn the old plates in or destroythem, or may be permitted to keep them. Some jurisdictions permit theregistrationofthe vehicle withpersonalplates.

2.3Character segmentation

: In this step get the o/p of extracted number plateusing labellingcomponents, andthenseparate eachcharacterandsplit theeach and every character in the number plate image byusing splitand alsofind the length of the number plate.

2.3.1 MATLABIMPLEMENTATION

MATLAB is a very powerful software tool used to implement the tasks thatrequire extensive computation. It provides easy and quicker implementation ofalgorithms compared to C and C++. The key feature in MATLAB is that itcontains a rich library functions for image processing and data analysis. Thismakes MATLAB an ideal tool for faster implementation and verification ofany algorithm before actually implementing it on a real hardware. Sometimes,debugging of errors on actual hardware turns out to be a very painful task.MATLAB provides an easy approach for debugging and correctionof errorsin any algorithm. Other than this, MATLAB contains many features includingworkspace, plot, imread, imhist, imshow, etc. for data analysis and imageprocessing, which makes it a better choice over other software languages likeCandC++.

2.3.2 ConvertaColoredImageintoGrayImage

Thealgorithmdescribedhereisindependentofthetypeofcolorsinimageand relies mainly on the gray level of an image for processing and extractingthe required information. Color components like Red, Green and Blue valueare not used throughout this algorithm. So, if the input image is a coloredimage represented by 3-dimensional array in MATLAB, it is converted to a 2-dimensional gray image before further processing. The sample of originalinputimage isshownbelow:

A binary image is one that consists of pixels that can have one of exactly twocolors, usually black and white. Binary images are also called bi-level or two-level, Pixel art made of two colors is often referred to as 1-Bit or 1bit. Thismeans that each pixel is stored as a single bit—i.e., a 0 or 1. The names black-and-white, B&W, monochrome or monochromatic are often used for thisconcept, but may also designate any images that have only one sample perpixel, such as grayscale images. In Photoshop parlance, a binary image is thesameasanimagein"Bitmap"mode.

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