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Number plate recognition system using matlab

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ABSTRACT

Traffic control and vehicle owner identification has become major problem in every country. Sometimes it becomes difficult to identify vehicle owner who violates traffic rules and drives too fast. Therefore, it is not possible to catch and punish those kinds of people because the traffic personal might not be able to retrieve vehicle number from the moving vehicle because of the speed of the vehicle. Therefore, there is a need to develop SIFT based Automatic Number Plate Recognition (ANPR) system as a one of the solutions to this problem. There are numerous ANPR systems available today.These systems are based on different methodologies but still it is really challenging task as some of the factors like high speed of vehicle, non-uniform vehicle number plate, language of vehicle number and different lighting conditions can affect a lot in the overall recognition rate.

Keywords: Automatic Number Plate Recognition, vehicle number, Traffic Rules

INTRODUCTION

Number plate recognition is a form of automatic vehicle identification. A number plate is the unique identification of vehicle. Real time number plate recognition plays an important role in maintaining law enforcement and maintaining traffic rules. It has wide applications areas such as toll plaza, parking area, highly security areas, boarder's areas etc. Number plate recognition is designed to identify the number plate and then recognize the vehicle number plate from a moving vehicle automatically.

Automatic number plate recognition is a mass surveillance method that uses optical character recognition on images to read the number plates on vehicles. Existing closed-circuit television or road-rule enforcement cameras, or specifically designed systems can be used for the task. This system is very helpful for traffic police to find the details of a car violating the traffic rules.

In this work the main problem to formulate to propose an efficient method for license plate localization in the images with various situations and complex background. At the first, in order to reduce problems such as low quality and low contrast in the vehicle images, image contrast is enhanced by the two different methods and the best for following is selected. At the second part, vertical edges of the enhanced image are extracted by sobel mask. Then the most of the noise and background edges are removed by an effective algorithm. The output of this stage is given to a morphological filtering to extract the candidate regions and finally we use several geometrical features such as area of the regions, aspect ratio and edge density to eliminate the non-plate regions and segment the plate from the input car image. This method is performed on some real images that have been captured at the different imaging conditions.

The appropriate experimental results show that our proposed method is nearly independent to environmental conditions such as lightening, camera angles and camera distance from the automobile, and license plate rotation. The

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proposed algorithm consists of three major parts: Extraction of plate region, segmentation of characters and recognition of plate characters. For extracting the plate region, edge detection algorithms and smearing algorithms are used. In segmentation part, smearing algorithms, filtering and some morphological algorithms are used. And finally statistical based template matching is used for recognition of plate characters. The performance of the proposed algorithm has been tested on real images. Based on the experimental results, we noted that our algorithm shows superior performance in car license plate recognition.

Number plates are used for identification of vehicles all over the nations. Vehicles are identifying either manually or automatically. Automatic vehicle identification is an image processing technique of identify vehicles by their number plates. Automatic vehicle identification systems are used for the purpose of effective traffic control and security applications such as access control to restricted areas and tracking of wanted vehicles. Number plate recognition (NPR) is easier method for Vehicle identification. NPR system for Indian license plate is difficult compared to the foreign license plate as there is no standard followed for the aspect ratio of licence plate. The identification task is challenging because of the nature of the light.

In NPR system spectral analysis approach is used were acquiring the image, extract the region of interest, character segmentation using SVM feature extraction techniques. The advantage of this approach is success full recognition of a moving vehicle.It is difficult to detect the boundary of the Number plate from the input car images in outdoors scene due to colour of characters of the number plate and Background of the Number plate the gradients of the original image is adopted to detect candidate number plate regions. There are also algorithms which are based on a combination of morphological operation, segmentation and Cannyedge detector.

License plate location algorithm consist of steps like as Edge Detection, Morphological operation like dilation and erosion, Smoothing, segmentation of characters and recognition of plate characters.

Literature Survey

"CAR LATERECOGNITIONSYSTEM"

DENIING JIANG Says that the Traffic control and vehicle owner identification has become major problem in every country. Sometimes it becomes difficult to identify vehicle owner who violates traffic rules and drives too fast. Therefore, it is not possible to catch and punish those kinds of people because the traffic personal might not be able to retrieve vehicle number from the moving vehicle because of the speed of the vehicle. Therefore, there is a need to develop Automatic Number Plate Recognition (ANPR) system as a one of the solutions to this problem. There are numerous ANPR systems available today. These systems are based on different methodologies but still it is really challenging task as some of the factors like high speed of vehicle, non-uniform vehicle number plate, language of vehicle number and different lighting conditions can affect a lot in the overall recognition rate. Most of the systems work under these limitations. In this paper, different approaches of ANPR are discussed by considering image size, success rate and processing time as parameters. Towards the end of this paper, an extension to ANPR is suggested.

ANPR or license plate recognition (LPR) has been one of the useful approaches for vehicle surveillance. It is 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 . ANPR algorithms are generally divided in four steps: Vehicle image capture Number plate detection Character segmentation and Character recognition. The first step i.e. 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. Presently number plate detection and recognition processing time is less than 50 ms in many systems. The success of fourth step depends on how second and third step are able to locate vehicle number plate and separate each character.

Method Of License Plate Location Based On Edge Detection And Color Information

Huili Han says this paper, we present an Automatic License Plate Recognition System (ALPRS) to identify license plates which is an application of image processing. The main process of ALPRS is divided into four steps: The noise in the image is removed by using FMH filter. A simple algorithm is used for background subtraction. Canny edge detection is used to localize the license plate location. Finally, letters and digits are extracted through template matching technique. The proposed algorithms have two advantages: First, the method has strong robustness against noise. Second, it can deal with license plates with different colors. The performance of the algorithm is tested in a real-time video stream. Based on the result, our

algorithm shows the missing rate is almost 16% from 70 vehicle images. The Intelligent Transportation Systems (ITS), the Automatic License Plate Recognition System (ALPRS) is a must. Nowadays, vehicles play an important role in transportation and their application is increasing rapidly. ALPRS usage have shown to have positive effect on controlling vehicle traffic. It is also very important for the development in the transportation infrastructure globally, especially in the developing countries such as Iran, where the ITS have been rising since few years ago.

ALPRS is an image processing technology that identifies vehicles by tracking their number plate without direct human intervention. ALPRS is also known by other various terms such as automatic license plate recognition, automatic license plate reader, number plate tracking, car plate recognition, vehicle number plate recognition, automatic vehicle identification, etc. The features of a standard number plate are as follows: background color, character color, character size, aspect ratio of number plate, font style, etc. Aspect ratio is a very important factor in vehicle's number plates and it is deducted by dividing number plates' width by it's height.: represent two-digit state district code, represent one letter code, represent three-digits code and represent actual registration number that is unique for each city of Tran. Developed an automatic number plate recognition system customized for real-time Iranian vehicles 174 number plate. According to our pilot experiments, our proposed extraction process works well for low resolution, noisy and low contrast images.

A Novel Approach For Indian License Plate Recognition System

Ch. Jaya LakshmisaysthisVehicle number plate recognition is the most interesting and challenging research topic from past few years. It is shown that the number plates are different shape and size and also have different color in different countries. In India the most common vehicle number plate used yellow or while as background and black used as foreground color. In this paper we proposed a system to localization of number plate mainly for the vehicles in West Bengal (India) and segmented the numbers as to identify each number separately. This paper presents an approach based on simple and efficient morphological operation and sobel edge detection method. We also presents a simple approach to segmented all the letters and numbers used in the number plate. After reducing noise from the input image we try to enhance the contrast of the binarized image using histogram equalization. Vehicle number plate Identification (VNPI) is a part of digital image processing which broadly used in vehicle transportation system to identify the vehicle.

Number plate recognition systems have wide range of application such as traffic maintenances, tracing stolen cars, automatic electronic Toll collection system and many more. But the main aim is to control the traffic management system. In State like West Bengal (India) the traffic management system developing day by day. In India the number plate containing white background with black foreground color for private cars and for the commercial vehicle used yellow as background and black as foreground color. An efficient less time consuming vehicle number plate detection method is proposed which performed on complex image. By using, Sobel edge detection method here detects edges and fills the holes less than 8 pixels only. To extracting the license plate we remove connected components less than 1000 pixels. Our proposed algorithm is mainly based on Indian automobile number plate system. Extraction of number plate accuracy may be increased for low ambient light image.

Automaticcar Registration Plate Using Fast Hough Transform

SHOKRI GENDY expresses that the development of automatic car registration plate recognition will provide greater efficiency for vehicle monitoring in automatic zone access control. Plate recognition will avoid the need to equip vehicles with special RF tags, since all vehicles possess a unique registration number plate. Alms0 the proposed recognition system can be used in conjunction with a tag system for higher security. There are a number of techniques which have been used for car registration plate characters recognition. These systems include BAM (Bi-directional Associative Memories) neural network character recognition and pattern matching of characters as two character recognition techniques which will be discussed in this paper. The object of this paper is to explore the potential of using Fast Hough Transform (FHT) in vehicle registration plate recognition. Image processing techniques have been used to extract plate characters, then FHT algorithm is applied to evety character in the image forrecognition and identification.

The FHT used in the paper is an efficient, fast and simple algorithm to identify characters, without requiring a relatively large memory. Law enforcement agencies have traditionally identified vehlicles its features such as colour, shape and model of vehlicle, or alternatively by the registration plate which is a unique identification for each car. In order to automate

the recognition of vehicle registration plates, imaging systems have been developed to perfom this task. As a result, many studies on automatic plate recognition have occurred over the last decade. The ongoing development of the automatic car reglistration plate recognition system will have an important rolt: in future security, traffic control and vehicle identification systems. The automatic identification of vehicles has been in considerable demand specially with the increase in the vehicle based offences. It can also play an important role in security zone access control and automatic toll road collection.The recognition of characters on car registration plates for the identification of vehicles. The Fast Hough Transform approach has been examined as a technique for optical character recognition.

Number Plate Recognition For Indian Cars Using Morphological Dilation And Erosion With The Aid Of Ocrs

P.ANISHIYA reveals that the Day by day we have been heard about the news of vehicle getting stolen from parking or from any other place in the city. So, to keep track of that stolen vehicle we should have to install the CCTV camera on every signal in the city. Also we have to install the number plate detection system which can detect the number plate of every vehicle on the traffic signal. For detecting the number plate from the moving vehicle there are many algorithm has been developed but still this area always remain evolving each every year, In number plate detection system image processing plays an important role, the system consist of basic operations preprocessing, image conversion from RGB to Gray, apply edge detection, apply morphological operators on same image then extract plate region from image and last process the plate region using OCR (optical character recognition).Every algorithm in this category always follows this basic steps, each algorithm has some pros and cons, because same algorithm cannot be useful for different environmental condition.

The Algorithm's efficiency is totally depends upon the quality of input image. E.g. resolution of camera, intensity of the image, illumination of image, shadow effect etc. In this paper we are focusing on which are different algorithm has been developed so far to improve the efficiency of the number plate detection system. The ANR (automatic number plate recognition) plays an important role in many systems like traffic monitoring system, Crime detection system, Stolen vehicle detection etc

Existing System

Image Quality Assessment algorithms are used for understanding the text extraction with a 'reference' or 'perfect' image. The image information measure that quantifies the information that is present in the reference image and also quantify how much of this reference information can be extracted from the distorted image. Combining these two quantities, visual information fidelitymeasure is recommended for image quality assessment. The Human Visual System (HVS)/Natural scene statistics (NSS) mainly focus on assessing the text extraction between a reference image and its non-geometrically variation versions. The advanced approaches such as Structural Text extraction Index (SSIM) and Visual Information Fidelity (VIF) can tolerate slightly the geometric variations. The VIF method is better than a HVS based method and also performs well in single-distortion as well as in cross-distortion scenario.

Image matching and recognition, Scale invariant feature transform features (SIFT) are extracted from a set of reference images and stored in database. A new image is matched by individually comparing each feature from the new image to this previous database and finding candidate matching features based on features based on Euclidean distance of their feature vectors using fast nearest-neighbor algorithms that can perform this computation rapidly against large databases. The key point descriptors are highly distinctive, which allows a single feature to find its correct match with good probability in a large database of features.

Disadvantages

- Cannot able to select End-to-End image Text Recognition.
- Less accuracy in the Text Spotter System on the selected frames.
- Character Detection as Extremal Region (ERs) Selection is not possible.
- Line formation & Character Recognition is not able to work in same time.
- Character Ordering is not possible.
- Optimal Sequence Selection is not able predict as high accuracy manner.

Proposed System

The proposed Optical Character Recognition systems needed to effectively and efficiently use large image databases. A OCR system, users will be able to retrieve relevant images based on their

contents. OCR systems followed two distinct directions

- Based on modeling the contents of the image as a set of attributes this is produced manually and stored, for example in a relational database.
- Using an integrated feature-extraction/object-recognition system.

Mainly the differences can be categorized in terms of image features extracted, their level of abstraction and the degree of domain independence. Certainly tradeoffs must be made in building a OCR system. For example, having automatic feature extraction is achieved at the expense of domain independence. A high degree of domain indecency is achieved by having a semiautomatic (or manual) feature extraction component. With OCR systems, querying is facilitated through generic query classes. Increasingly specialized grouping activities that produces a "blob world" representation of an image, which is a transformation from the raw pixel data to a small set of localized coherent regions in color and textual space.Assessment of image text extraction is fundamentally important to numerous multimedia applications.

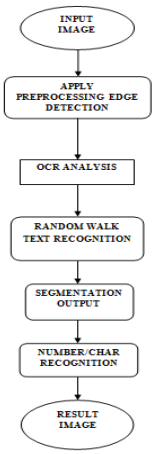
The goal of text extraction assessment is to automatically assess the similarities among images in a perceptually consistent manner. Specifically, a feature-based approach to quantify the information that is present in a reference image and how much of this information can be extracted from a test image to assess the text extraction between the two images. Extract the feature points and their descriptors from an image, followed by learning the Dictionary Score /basis for the descriptors in order to interpret the information present in this image.

Represent all of the descriptors of an image via sparse representation and assess the text extraction between two images via sparse coding technique. The main advantage is, a feature descriptor is sparsely represented in terms of a Dictionary Score or transferred as a linear combination of Dictionary Score atoms, so as to achieve efficient feature representation and robust image text extraction assessment.

Advantages

- High in performance on End-to-End image Text Recognition.
- Threshold value is dynamic.
- High Mapping to a totally order set (colour space projection)
- Adjacency relation is possible.
- Thresholds that most probably correspond to a character segmentation are selected using a OCR classifier, multiple hypotheses for each character are generated .
- Best result in accuracy on the Text Spotter System on the selected frames.
- Character Detection as Extremal Region (ERs) Selection is possible.
- Line formation & Character Recognition is not able to work in same time.
- Character Ordering is possible.
- Optimal Sequence Selection able predict as high accuracy manner**.**

System Model



Methodology

Modules

- PREPROCESSING
- NUMBER PLATE RECOGNITION
- CHARACTER ANALYSIS DISCUSSION
- CHARACTER RECOGNITION

Preprocessing

Gray scale is often used in image processing and image analysis. Images acquired by camera always reflect the camera settings; among many include color and hue, essentially an image can be in its natural form or slightly altered, colored images are complex in space and time, it is therefore important to convert colored images to gray scale to reduce time and space complexity. The basic concept of gray conversion is to eliminate hue and saturation image while maintaining its luminance.

In this process, the threshold of an image with correct gray scale value is calculated for the purpose of separating the object of interest from background. Thresholding is important to provide sufficient contrast of an image such that, different level of intensity between foreground and background are taken into consideration. For computational purposes gray scale improves the quality of an image and later computational processes. Basically in a gray scale image the contrast frequency calculated for each position in the template creating a new image using the defined threshold value where by any color above threshold is set to white and below threshold is set to black. Gray scale images consist of different ranges of gray values; from 0 to 255. JAVA rgb2gray function converts an RGB image to gray scale image.

Binary conversion process

A binary image has only two values for each pixel, 0 and 1 corresponding to black and white. A gray scale image has eight bits of information per pixel, hence, 256 possible gray values.

Binary conversion involves the process of converting a gray scale image to binary image. The output image replaces all pixels at the input image with luminance greater than 'level' with value 1(white) and other pixels with value 0 (black) as indicated; level range (0,1).

It can be assumed that the level value is 0.5 as midway between black and white for all class images. The level of optional threshold value of an image can be computed by function 'graythresh () in JAVA.

Optional threshold level selection is necessary as the high limit tends to merge the label with the background (black), while a lower limit tend to bridge the digit with foreground the label white region. Binary conversion is important as it improves the quality and extracts information from an image. Binary images are less complex because of their reduced complexity.

Edge Detection

Edge detection is the process of localizing pixel intensities transitions or identification of sudden changes (discontinuities) in an object within the image. Edges are a significant local change of intensity in an image. Edges typically occur on boundary between two different regions in an image. To find edges, edge detection function is used. This function rapid change varies in images brightness and marks the edge.Edge detection aims capturing important features, events and properties of an image. Edge return a binary image containing ones at edges and zeros elsewhere.

Available edge detectors available are sobel, prewitts, Roberts, canny and artificial neural network as identified in literature. Canny is identified as powerful edge detector because it uses two thresholds detecting strong and weak edges

Character Analysis 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 character segmentation is not discussed with details. Some methods such as image binarization, vertical and horizontal projection can produce better results of character segmentation.

Character Recognition

Character recognition helps in identifying and converting image text into editable text. As most of the number plate recognition algorithms use single method for character recognition. In this section, each method is explained.

Artificial Neural Network (ANN)

Artificial Neural Network (ANN) sometimes known as neural network is a mathematical term, which contains interconnected artificial neurons. Several algorithms such as based on ANN. In two layer probabilistic neural network with the topology of 180-180-36. The character recognition process was performed in 128ms. In multi layered perception (MLP) ANN model is used for classification of characters. In contains input layer for decision making, hidden layer to compute more complicated associations and output layer for

resulting decision. Feed forward back-propagation (BP) algorithm was used to train ANN. BP neural network based systems are proposed with the processing time of 0.06s.

HNN is applied to reduce ambiguity between the similar characters e.g. 8 and B, 2 and Z etc. The authors claim to have more than 99% recognition rate.

Template matching

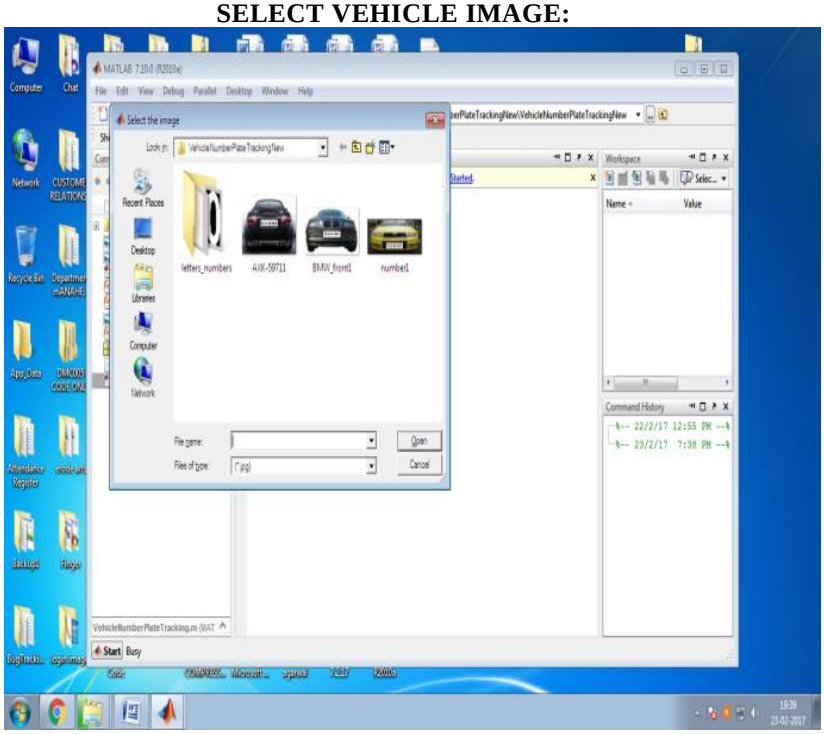
Template matching is useful for recognition of fixed sized characters. It can be also used for detection of objects generally in face detection and medical image processing. It is further divided in two parts: feature based matching and template based matching. Feature based approach is useful when template image has strong features otherwise template based approach can be useful. In statistical feature extraction method is applied for achieving 85% of character recognition rate.Several features and extracted and salient is computed based on training characters. A linear normalization algorithm is used to adjust all characters with uniform size. The recognition rate of 95.7% is achieved among 1176 images. An OCR based approach is used for feature extraction English, Numeric characters. The authors achieved success rate of 97.8% for numerals and Characters.

Feature-based approach relies on the extraction of image features such, i.e. shapes, textures, colors, to match in the target image or frame. This approach is currently achieved by using Neural Networks and Deep Learning classifiers such as VGG,AlexNet, ResNet. Deep Convolutional neuralNetworks process the image by passing it through different hidden layers and at each layer produce a vector with classification information about the image. These vectors are extracted from the network and are used as the features of the image. Feature extraction by using Deep Neural Networks is extremely effective and thus is the standard in state of the art template matching algorithms.

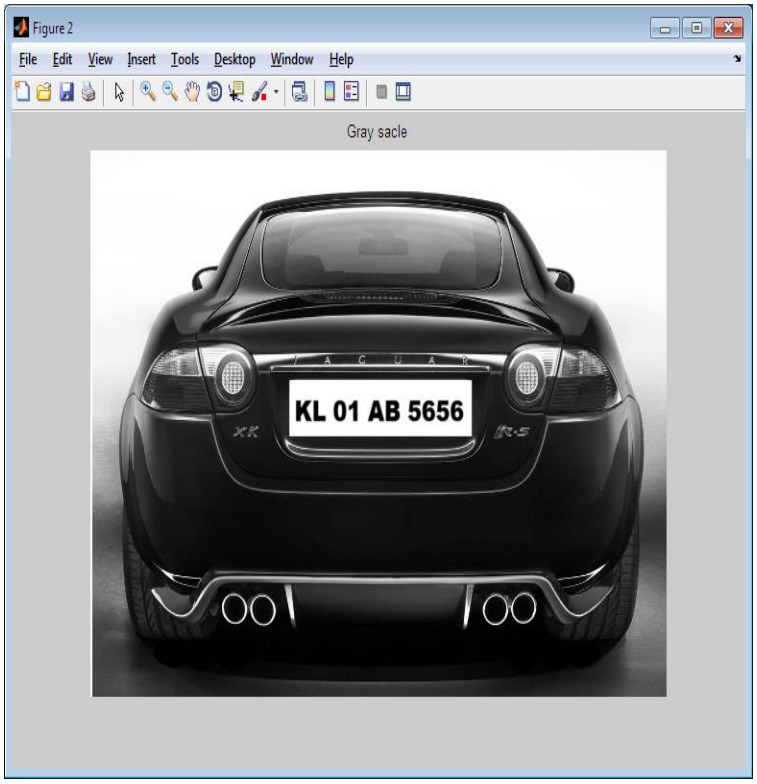
For templates without strong features, or for when the bulk of the template image constitutes the matching image, a template-based approach may be effective. As aforementioned, since template-based matching may potentially require sampling of a large number of points, it is possible to reduce the number of sampling points by reducing the resolution of the search and template images by the same factor and performing the operation on the resultant downsized images (multiresolution, or pyramid), providing a search window of data points within the search image so that the template does not have to search every viable data point, or a combination of both.

EXPERIMENTAL RESULTS

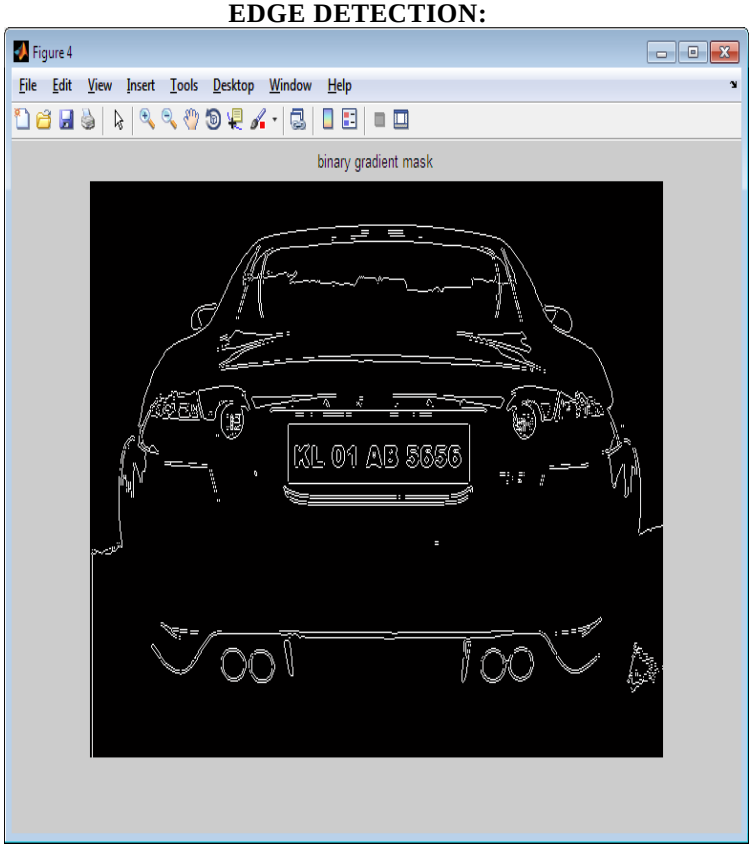
SELECT VEHICLE IMAGE:



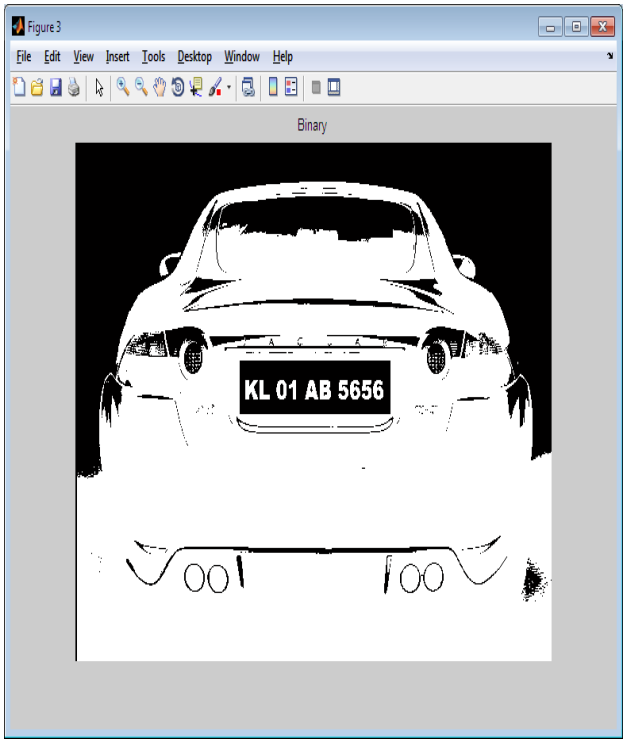
INPUT VEHICLE IMAGE:



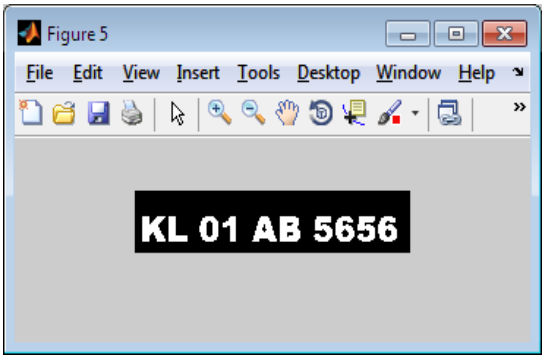
EDGE DETECTION:



NUMBER PLATE RECOGNITION:

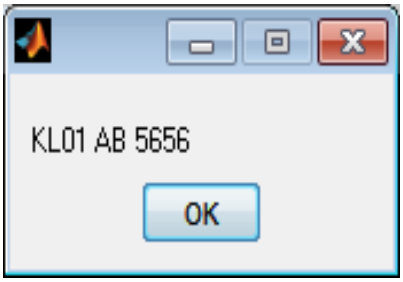


CAPTURING NUMBER PLATE PART:



OBSERVING NUMBER AND CHARACTER SKELETON:

DISPLAYING NUMBER PLATE INFO:



CONCLUSION

In this project, reducing labor cost technology. The recognition of new font characters by the system is very easy and quick. If can reuse the edited information as and when required. The extension to software other than editing and searching is topic for future works. The Grid infrastructure used in the implementation of Optical Character Recognition system can be efficiently used to speed up the translation of image baseddocuments into structured documents that are currently easy to discover, search and process.

Our algorithm successfully detects the number plate region from the image which consists of vehicle number & then character segmentation, recognition .User have applied our algorithm on many images and found that it successfully recognition. The project was designed keeping in mind the automation of the number plate detection system for security reason that could replace the current system of manual entry.

This project was a success in recording the number plate of a vehicle although it has got its own limitation of image processing and other hardware requirements.

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