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KIRSCH COMPASS KERNEL EDGE DETECTION FOR VEHICLE NUMBER PLATE DETECTION USING IMAGE PROCESSING

K Sunil Kumar[1], P Ratna Harinya[2], L Divya Sri[3], K Sushmita[4], K Vaishnavi[5]

[1]*Assistant Professor, Dept. of ECE, Vignans Institute of Engineering for Women, Vizag, A.P, India*
[2] *B.Tech (final year), Dept. of ECE, Vignans Institute of Engineering for Women, Vizag, A.P, India*
[3] *B.Tech (final year), Dept. of ECE, Vignans Institute of Engineering for Women, Vizag, A.P, India*
[4]*B.Tech (final year), Dept. of ECE, Vignans Institute of Engineering for Women, Vizag, A.P, India*
[5]*B.Tech(final year), Dept. of ECE, Vignans Institute of Engineering for Women, Vizag, A.P, India*

Abstract - *Vehicle number plate recognition is the most exciting and challenging research topic from past few years. The problems faced is mainly, while capturing moving vehicle image is, quite missing all its originality due to noises and due to environmental situations. The image captured which is analyzed by our eyes can only see a few lines of the image obtained. So we need better algorithms for processing the image. Edge detection plays a crucial role in detecting clear cut image output. If the edge detection is done perfectly then the properties of the image like intensity, area etc., can be analyzed perfectly. The process of extracting the number plate region is done by techniques such as Bounding Box.*

***Key Words*: MATLAB, Gaussian filter, Kirsch Kernel Edge detection Morphological image processing, Bounding Box technique, Character Segmentation.**

1. INTRODUCTION

This process takes input as an image of a vehicle, in order to perform pre-processing. The pre-processing results in improving the image data which suppresses the unwanted distortions and also enhances some important features of the image for further processing. In the pre-processing technique the input RGB image is first converted into binary image and then it is converted into binary image by using a simple technique called Thresholding. The processed image is then given to segmentation. Image Segmentation is used to locate boundaries (lines, etc.) in image. In order to locate the number plate region Kirsch compass kernel edge detection technique is used. The Kirsch compass kernel finds the maximum edge strength in a few predetermined directions.

The edge detected image is further given for morphological image processing such as Dilation, Erosion etc. Morphological image processing is a collection of non-linear operations related to the shape of morphology of features in an image. The final character segmentation is done by using bounding box technique, which extracts the content of the region where it is placed.

2. PROBLEMS FACED

The captured image while moving is quite missing all its originality due to the addition of noises and due to the environmental situations. The captured image which is analyzed by our eyes can only see few lines of the image obtained. So we are in need of the better algorithms for processing.

3. WORK DONE

The below diagram shows the proposed method:

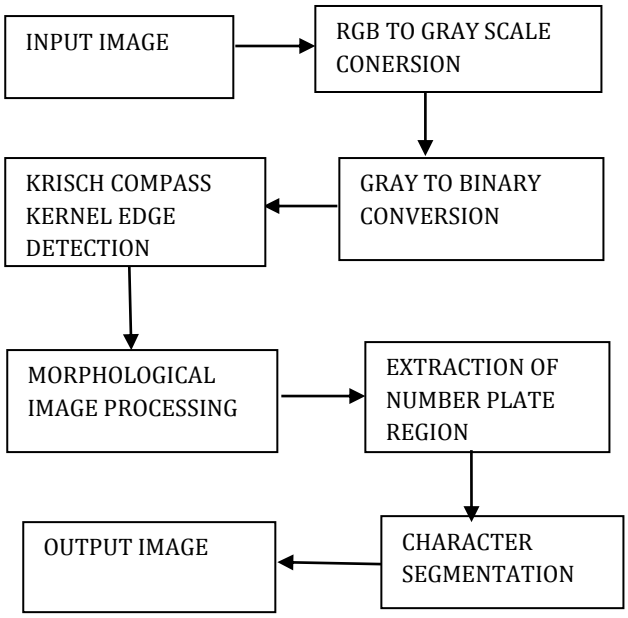

FIG : 1 Proposed method

A. INPUT IMAGE

This input image is image captured by a digital camera.

Fig -2: Input RGB image

B. PREPROCESSING

The preprocessing technique converts the input image to binary image by first performing conversion of grey scale operation and then gray scale image is converted into binary image for further processing.

FIG: 3 Gray scale image

FIG: 4 Binary image

C. KRISCH COMPASS KERNEL EDGE DETECTION TECHNIQUE

Kirsch edge detection is used to find the maximum edge strength in it's EIGHT predetermined compass directions. Thus operator takes a single kernel and rotates it in 45 degree agreement which results in all 8 possible compass directions i.e north, northwest, northeast, south, southeast, southwest, east and west. The fixed 3*3 kernel mask values for all the images in 8 compass directions are as follows:

5	5	5	5	5	-3	5	-3	-3	-3	-3	-3
N=	-3	0	-3	NW =	5	0	-3	W=	5	0	-3	SW=	5	0	-3
-3	-3	-3	-3	-3	-3	5	-3	-3	5	5	-5				

-3	-3	-3	-3	5	5	-3	-3	-3	-3	-3	-3				
E=	-3	0	5	NE=	-3	0	5	S=	-3	0	3	SE=	-3	0	5
-3	-3	5	-3	-3	-3	5	5	5	-3	5	5				

The algorithm for the kirsch kernel edge detection is as follows:

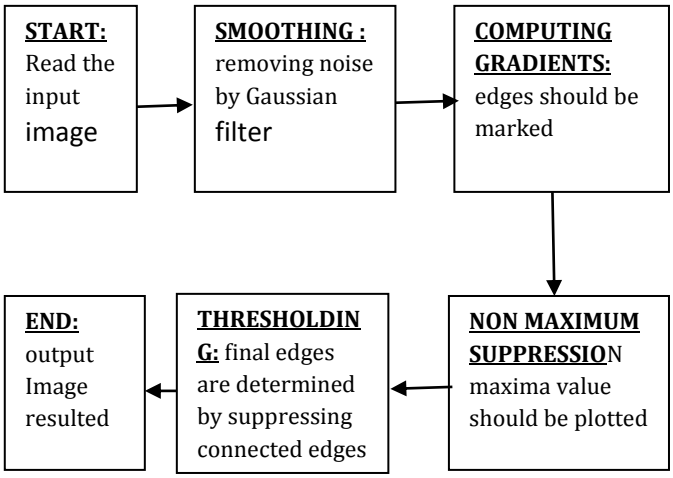

FIG: 5 Algorithm for kirsch compass kernel edge detection

:

FIG: 6 Edge detector output

D. MORPHOLOGICAL IMAGE PROCESSING

Morphological techniques modifies an image with a small shape or template called a structuring element. The structuring element is nothing but a matrix which features to measure the shape of the image. It is compared with neighborhood of pixels.

a. DILATION:

The binary gradient mask obtained after the edge detection process shows lines of high contrast in the image. These lines do not highlight the object of interest. Compared to the input image, the gaps present in the lines are observed that surrounds the object in the binary gradient mask. These linear gap disappears if the gradient image is dilated using the structuring elements.

FIG: 7 Dilated image

b. REMOVAL OF INTERIOR HOLES:

The gradient mask obtained after dilation shows the edges or outline of the cell clearly, but there are still holes present in the interior of the cell. Holes are nothing but a set of background pixels that are not processed during dilation. MATLAB toolbox provide a function imfill (BW, holes") that fills holes in the dilated image.

c. EROSION:

In order to make the segmented object look natural, the image is eroded with the structuring element. This extraction process helps in extraction of number plate area of the vehicle. This erosion operation also helps in removing the connected objects to the border of region of interest.

FIG:8 Eroded image

E. EXTRACTION OF NUMBER PLATE REGION

In order to extract the number plate region from the entire image segmentation operation is performed. Segmentation is one of the most important process in the number plate detection, because all further steps depends on this process. If the segmentation fails, a image or the object of interest can be improperly divided into two pieces. For better performing the segmentation process bounding box technique is used. The bounding box technique is used to measure the properties of the image region where it is placed.

a. CROPPING AN IMAGE:

The cropping of the number plate location is done by giving the inputs eroded image and the properties obtained from the bounding box technique. Imcrop (I, Bounding box) function is used to crop the number plate location.

FIG: 9 Cropped image

b. AREA OPENING AN IMAGE:

Bwareaopen(BW, P) removes all connected components(objects) that have fewer than P pixels that have fewer than P pixels from the binary image BW, producing another binary image, BW2. This operation is known as an area opening.

FIG:10 Opening an image

F. CHARACTER SEMENTATION

In order to segment each character and display them in individual MATLAB window for performing the template matching operation, once again the bounding box technique is implemented. Bounding box is a rectangular border that is fully encloses a digital image where it is placed over a page. The properties such as length and area of the individual character is given to the bounding box operation each character & number is separate out for recognition of number plate.

It is now used to compare each individual character against the complete database which consists of both numeric as well as alphabets using template matching. The extracted characters are displayed in MATLAB window as follows:

FIG: 11 M.bmp

FIG:12 H.bmp

FIG: 13 1.bmp

FIG:14 4.bmp

FIG: 15 D.bmp

FIG: 16 T.bmp

FIG:17 8.bmp

FIG:18 8.bmp

FIG:19 3.bmp

FIG:20 1.bmp

4. APPLICATIONS

1. ***Parking*:-**The number plate detection is used to automatically enter prepaid members and calculate parking fee for non-members.

2. ***Access control*:-**A gate automatically opens for authorized members in a secured area, thus replacing or assisting the security guard.

3. ***Airport Parking:-***In order to reduce ticket frauds or Mistakes, the number plate detection unit is used to capture the number plate and image of the car**.**

5. CONCLUSION

In this project, the input image is an RGB image of a vehicle number plate captured by a digital camera is being processed and segmented into characters which are displayed in individual MATLAB windows. Due to this process vehicle number plate detection is more accurate. The procedure involves techniques like Edge detection, Bounding Box technique, Morphological image processing. The kirsch compass kernel edge detection technique is different from the edge detection techniques like Sobel, canny, pewit, etc. This technique involves a compass masks in eight directions for better edge detection.

6. REFERENCES

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