**RESEARCH ARTICLE**

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# NUMBER PLATE RECOGNITION OF VEHICLE(S) USING THRESHOLDING AND HISTOGRAM EQUALIZATION

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**ABSTRACT**

Number plate recognition is one of the main area in vehicular technology. In this method number plate of vehicle(s) is/are detected using Thresholding and Histogram equalization. For the input image filtering is done. Thresholding would remove the unwanted data. Finally Histogram Equalization and edge detection would give the extracted number plate. The proposed method has advantages compared to existing methods because it detects the number plate for multiple vehicles simultaneously.

*Keywords*— Number plate recognition, Thresholding, Histogram Equalization, Edge detection, multiple vehicles.

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## I. INTRODUCTION

Automatic Number Plate Recognition (ANPR) systems allow users to track, identify and monitor moving vehicles by automatically extracting their number plates. These systems are rapidly becoming used for a vast number of applications. In this method number plate is extracted by filtering followed by thresholding and the last step is Histogram equalization followed by Edge detection which gives the extracted number plate.
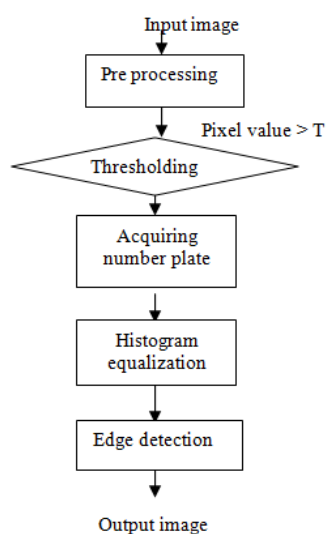
## II. PROPOSED METHOD



Fig: Flow chart for number plate recognition

*A. Pre processing:* The input color image or RGB image is converted to grey level image.

*B. Thresholding:* Thresholding considers high intensity pixels and eliminates the lower intensity pixels. Next step is filtering where median filter is applied. The median filter, nonlinear digital filter technique, frequently used to eliminate noise. This type of noise reduction is a usual pre-processing step to advance the results of post processing (Eg: edge detection on image). Median filtering is mostly used in digital image processing since under valid conditions, it keeps edges while eliminating noise.

*C. Acquiring number plate:* After filtering, connected components are acquired from which the area of the connected component is calculated. Lower bounds and upper bounds are defined here to further calculate the connected components. And then again the areas are calculated. The resultant values are rounded off and thereby the number plate is acquired.

*D. Histogram Equalization:* The contrast of the images is enhanced using histogram equalization. The matlab code word histeq is used for this.

*E. Edge Detection:* Edges for the histogram equalized image is detected. Sobel operator is used for edge

detection. The matlab code word edge is used for detecting edges in the image.

After performing all these steps with accurate threshold value number plate can be extracted completely.

**III.    EXPERIMENTAL RESULTS**

Input color image is taken for which we need to extract the vehicle.

Original Image



Fig: Original image The input color image is converted into gray scale image.

Grayscale Image



Fig: Gray scale image

Median filtering is applied to the gray scale image. The resultant image is as shown below-

Filtered Image



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Fig: Image after filtering

Thresholding is applied on the filtered image which removes unwanted pixels. The result would be as shown-

Thresholded Image

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Fig: Thresholded image

The thresholded image is converted into black and white image. The result would be as follows-

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Fig: Black and white image

Histogram Equalization is applied on the black and white image which gives following output-

histogram equalization

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Fig: Histogram equalization

For the histogram equalized image edges are detected. Edge detected image is as shown below-
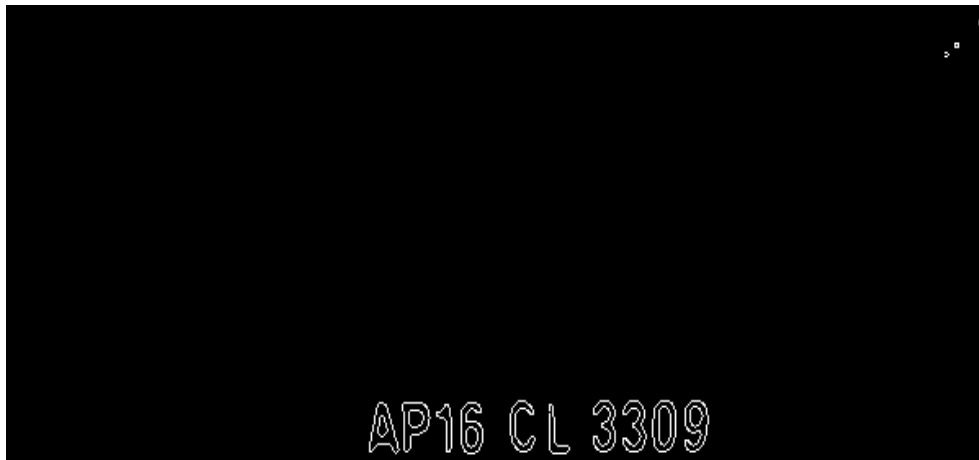
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Fig: Output after edge detection

After filling holes we can obtain the final output.

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Fig: Final output

Number plate recognition for multiple vehicles-

Original Image
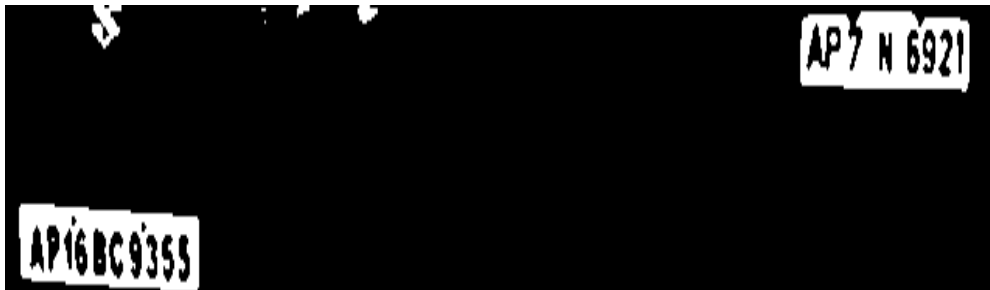


Fig: Original image

Grayscale Image



Filtered Image



Fig: Image after Filtering
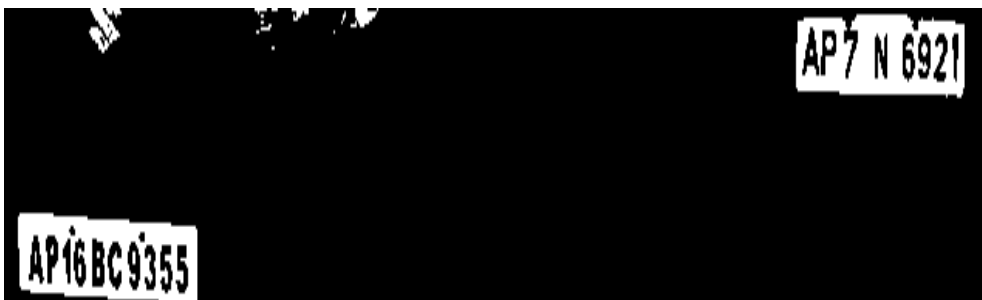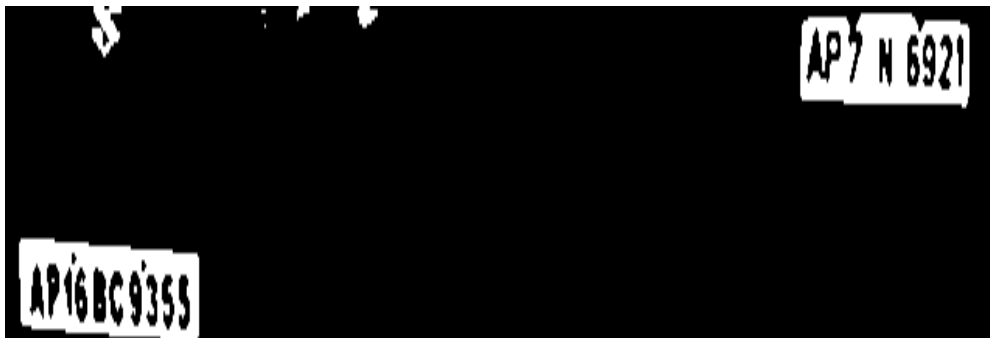
Thresholded Image



Fig: Image after Thresholding



Fig: Final output

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## IV. CONCLUSION

The algorithm uses Thresholding and Histogram equalization to extract the number plate accurately. Filtering and Thresholding removes the background completely. Histogram equalization would extract the number plate. This method could detect the number plate of multiple vehicles which was an advantage compared to the existing methods. It can also extract number plate of the vehicle which has a damaged number plate. The extracted number plate is used by data base applications to know the information of the vehicle. Further extensions can be done to this method such as applying it to a video etc.,

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