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Automated Driving Vehicle Using Digital Image Processing

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Abstract

This paper is focus on intelligent road symbol detection system for vehicles in normal environment conditions. The main goal is matching similar patterns. The input images are get from the overhead mounted camera. Then the noises are removed from the input images and the required information are obtained. Here we have used MATLAB for image processing and a microcontroller interfaced with it for actual real time processing and actuation of commands.***Keywords:*** *Author Guide, Article, Camera-Ready Format, Paper Specifications, Paper Submission.*

1. Introduction

Nearly 3 400 people die on the world's roads in daily. Tens of millions of people are injured or disabled every year. Automated Driving Vehicle is useful one to decrease road accidents. Signal processing concepts such as image processing and Computer Vision along with algorithms of Data Structures i have developed a prototype of an autonomous vehicle with the a motivation to decrease the accidents.

This is the decentralized process. Here symbol detection is one module and direction control is another module. Obstacles such as other vehicles are identified by the connectivity of pixels, slope of pixels, morphological operations, and connected components at the boundary of the path of the road. The traffic density is estimated by the grayscale values of vehicles, road, obstacles {in our case white for vehicle and black for the road (binary colors used)} thus properly estimating the time to wait at cross roads. Thus in this way we have deployed a method to mad**e road transport much safer and** efficient.

2. Methodology

2.1 Video acquisition

The continues images are taken from the head mounted camera which is installed in the front of the vehicle. The images are taken in the particular fixed trigger intervals. The trigger interval also known as frame rate. The accuracy and response precision of the system is highly depends on the frame rate.

2.2 Pre-processing

The obtained frames are converted to grayscale images and then to binary images to apply thresholding algorithms. After this, Gaussian filtering techniques are applied to obtained frames to remove noise present in the form of small holes and blobs. Morphology functions are further applied to obtain binary frames with no noise present.

2.3 Edge Detection

Edge detection is area of significant change in the image intensity or contrast. Another word for edge detection is image segmentation. Canny edge detection technique is used to detect the edges in the preprocessed images.

Canny Edge Detection: The Canny edge an edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images. Canny method is a better method without disturbing the features of the edges in the image afterwards it applying the tendency to find the edges and the serious value for threshold.

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The algorithmic steps are as follows:

1. Convolve image f(r, c) with a Gaussian function to get smooth image f^(r, c).

$$f\hat{}(r, c)=f(r,c)*G(r,c,6)$$

2. Apply first difference gradient operator to compute edge strength then edge magnitude and direction are obtain as before.
3. Apply non-maximal or critical suppression to the gradient magnitude.
4. Apply threshold to the non-maximal suppression image.

Threshold Algorithm: Threshold is one of the widely methods used for image segmentation. It is useful in discriminating foreground from the background. By selecting an adequate threshold value T. Then all the gray level values below this T will be classified as black (0), and those above T will be white (1). The segmentation problem becomes one of selecting the proper value for the threshold T.

3. Morphology functions

There are several morphological operations are performed here to get a processed output. The steps involved here are.

3.1 Dilation

The binary gradient mask shows lines of highcontrast in the image. The lines do not quite delineate the outline of the object of interest. Sobel image is dilated using the linear structuring elements. The binary gradient mask is dilated using vertical structuring element followed by the horizontal structuring elements.

3.2 Filling the Holes:

The dilated gradient mask shows the outline of the image quite nicely, but the holes (noise) in the interior of the images still appear. To avoid this noise we use filling the holes algorithm . The image that has been segmented has found that some objects connected to its region. The connected borders are removed to give a needed portion as an output.

3.3 Smoothen the Object

Finally the obtained object is to be smoothen as that the segmented object should look natural as compared with the original image. This can be done eroding the object. Here we create a diamond structuring element for the accuracy of the image. As eroding the image twice we get a cleared image.

4. Conclusions

The process of proposed system using the canny operator to detect the edges in the image. The canny operator takes more processing time for road symbol detection. So, the accuracy of the vehicle is low. For further we can use a other operators such as, prewitt or slobe operators for edge detection and the accuracy of the vehicle is also depend on the number of frames per second so, further we can increase the frame rate.

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