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Object Visual Reorganization for Autonomous Vehicles Using Sign Detection and Image Processing

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ABSTRACT

Now a days, sign detection is mainly used to help the driver and give instructions through audio and video feedback, and it leads to decreasing the number of accidents. The goal of the work is to define a method for traffic light detection and sign detection. Using this method driver can accurately detect traffic light colors i.e., orange, red, green, and different signs like U-turn, turn left, turn right, forward. Road sign use the basis color for distinguishing it from other objects. In intelligent transport systems computer vision is mainly used. The traffic sign detection systems have an integral part of Advanced Driver Assistance Systems. This work contains four major process: traffic sign detection, lane detection, Character recognition,video frame capturing.

Keyword: image processing, traffic, character recognition

1. INTRODUCTION

Advanced technology has become the integral part of our life (1). To satisfy the need of the society, almost in each work, we use the technology (2) (3). In current era computer science is major subject (4). It has many real life applications such as cloud computing (5), artificial intelligence (6), remote monitoring (7), Wireless sensor network (8; 9; 10), internet of things (11; 12; 13), Neural network (14; 15), FSPP (16; 17; 18), NSPP (19; 20; 21; 22; 23), TP (24; 25; 26), internet Security (27), uncertainty (28; 29; 30; 31; 32) and so on. Technology is the mode by which user can store, fetch, communicate and utilize the information (33). So, all the organizations, industries and also every individual are using computer systems to preserve and share the information (34) . The internet security plays a major role in all computer related applications. The internet security appears in many real-life applications, e.g., home security (35), banking system, education sector, defense system, Railway, and so on. In this manuscript we discuss about the protection of authentication which is a part of internet security.

The main objective of this paper is to provide a detailed explanation of the Object visual Recognition for Autonomous vehicles using sign detection and Image processing. Also, in this document we mentioned the hardware and software requirements for the Object visual Recognition for Autonomous vehicles using sign detection and image processing. This document will specify the usage and features of the project, the kind of platform supports, what kind of options are available in the software.The python has huge library collection which is used in real time works. Here we used some standard libraries to detect the lane and sign recognition that modules are OpenCV, Pillow and Pip.OpenCV is one of the modules in python install that package and import in work. It mainly focuses on image processing, object detection, video detection, face detection, and analyzing the data. Image processing it takes the input image and process the image and it gives the appropriate result of the image.

2. MOTIVATION

The main motivation this work is to improve car safety and efficiency. The objective of developing autonomous car is to “prevent road accidents, reduce people’s time and control carbon emissions. If autonomous cars can be leads safer and much more efficiently, it could save people’s lives and protect the environment. In daily life all car accidents are caused by human careless and their mistakes, autonomous cars would neglect all hazards as well as driver fatalities and injuries.

3. RELATED WORKS

3.1 Lanes detection

In this work lane detection is one of the most important process in the Automated driver assistance system and it can be used for automotive navigation, control, avoid accidents, or lane crossing warning system(36). Many of the road conditions cause this problem it’s become complicate to adding various types of lanes (curve, straight), occurring blocks caused by speed breaker, shadows, obstacles, street lights in night time

and so on. In recent times, there have been many ideas are proposed for rectify these problems in lane detection.(37)

3.2 Road sign recognition

In this traffic sign detection area, most of the works are published and it's separated the classification and detection of road sign in two different problems. The most complex step in traffic sign recognition is it should detect the traffic signs from outdoors. The characteristics of traffic signs are well-defined shapes and colors of the signs it could be utilized. The sign detection common problem is use image color information or image shape information. Color information is commonly performing color-based approach of the image. Its necessity to extracted and analyzed and should analyze how much information in the image. Image color information is very complicate to perform RGB color. Red Green Blue colors are very sensitive to illuminate changes and traffic scenario mount to have varies radiance(38). Image shape information are below mentioned under some strategies, road corner detection, pattern matching, fast lane transform, Hough transform, algorithms etc... During road corner detection it determined the shape of candidate region. To locate lines or circles using Hough transform to a sign.(39) Use genetic algorithm technique to detect the circular traffic signs. Pattern matching with shape format is commonly used for researchers.

4. PROPOSED SYSTEM

According to their functionality, it mediates in different level of the control algorithms involved in Driver Assistance Systems (40). In proposed method is implementation through simulation using Open Computer Vision. It automatically starts to search for obstacles, when the car engine on. If the road is empty, it starts continuously running move forward until if there is find any obstacles. When it detects obstacles, it eliminates and separates them. If it finds any obstacles In front of the vehicle it automatically neglects to move backward movement also. Consequently, the sensor of the vehicles performs other side the same process (41).The proposed system consists of two categories: Lane Detection and Road Sign Recognition. The functions of each module are explained in details below sections (42).

4.1 Lane Detection

In autonomous vehicle very important module is lane detection. It is used for all intelligent transportation systems. Lane detection process firstly its marks and extract. The lane based on color information and the binary image with canny line detection.(43) Next process of the lane detection is defining the Region of Interest it helps to avoid the unwanted objects in the image. The starting process of lane detection is calculating the histogram of the binary image. Applying slide windows from starting points, from the pixels of the lane lines. Images and videos of the lane lines are detected by proposed algorithm.(44)

The Road Lane Detection has following steps,

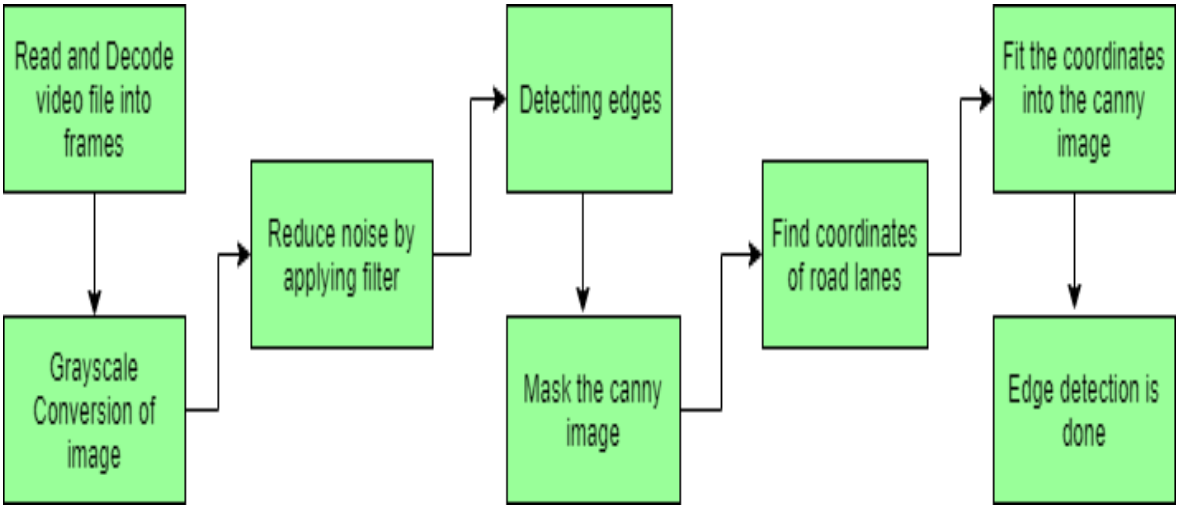

Fig 4.1.1 Road Lane Detection Process

4.2 Lane Mark Extractions

First, the image in RGB color space, then it converts into LAB color space. Then apply sobel filter in x-axis and y-axis.(45)

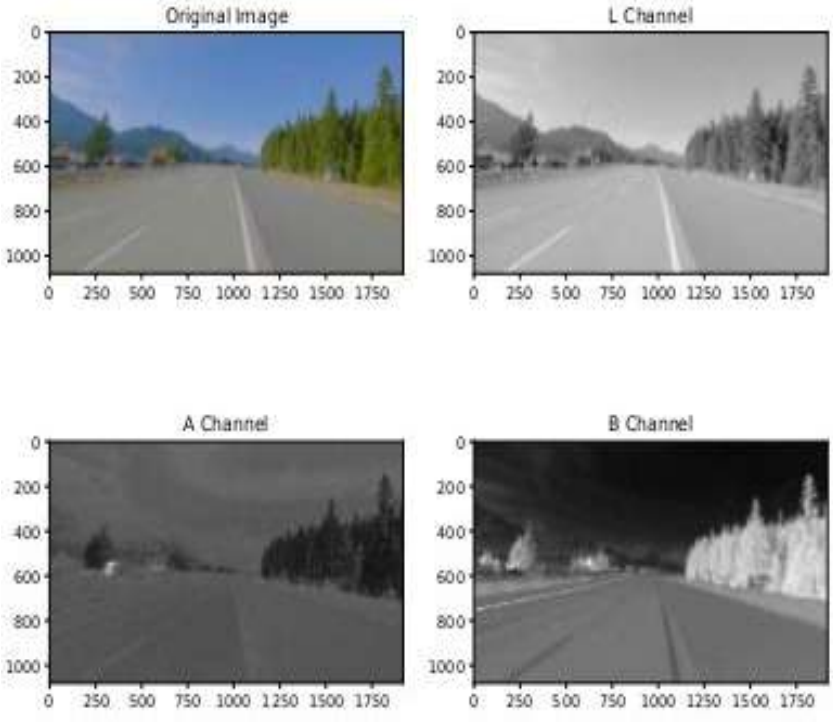

Fig 4.1.2 Original image and LAB color space

4.3 Lane Position Determination

To generate the rectified binary image with bird-eye-view by using the warp perspective function in open computer vision by applying perspective transform. To obtain a magnitude and direction-based binary image, by use the combination of color and gradient thresholds. The image potentially belongs to the lane marks with the white pixels. The lower half of the wrapped binary image and highest points are taking the peak detection function.(46)

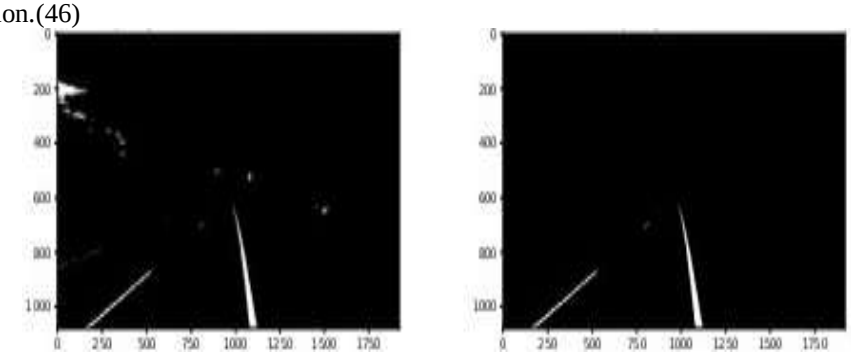

Fig 4.1.3 Binary Images

If the car drives away from the centre of the lane, itsimply divided into left and right side and the peak detection end result will be incorrect. An assertion loop is implemented in this function to solve this problem. Let us consider the lane width is not less than 700 pixels and compare to the real image actual size. If the two distance is less than width, it will adjust the centre based on the current peak location. The detected lane marks are potential starting points from the accumulated values in each side.(47)

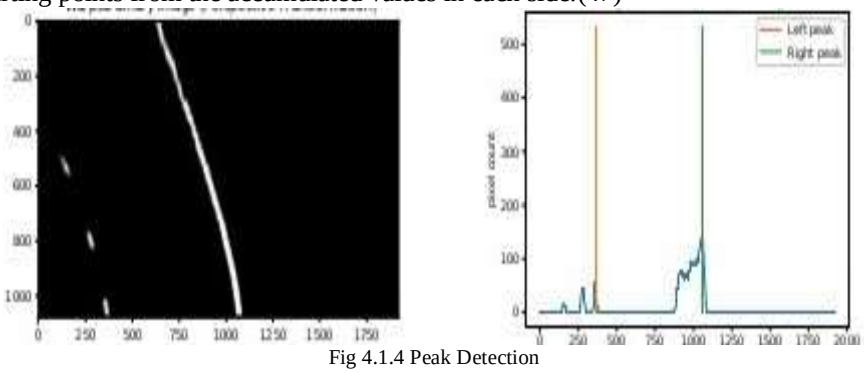

Fig 4.1.4 Peak Detection

4.4 Lane Mark Recognization

It begins tracking lanes in the binary images with continuous of left and right moving of windows upwards in the sliding windows detection function. In the histogram search window start detect the peaks. It is not possible to activate pixels in a search windows if the lane is dashed. The window will be re-centered to the mean position.(48)(49)(50) The previous lane position can be used as a reference to improve the efficiency of windows detection, when the frames are continuous. In other lane line and lane width, the window will make a guess. A list of left and right pixel locations is collected, After the search. NumPy function is used to fit a quadratic equation to all the pixels. Using the inverse matrix of the perspective transform, the detected lane can overlay on the real image. The inverse matrix of the perspective transforms to visualize the algorithm result.(51)

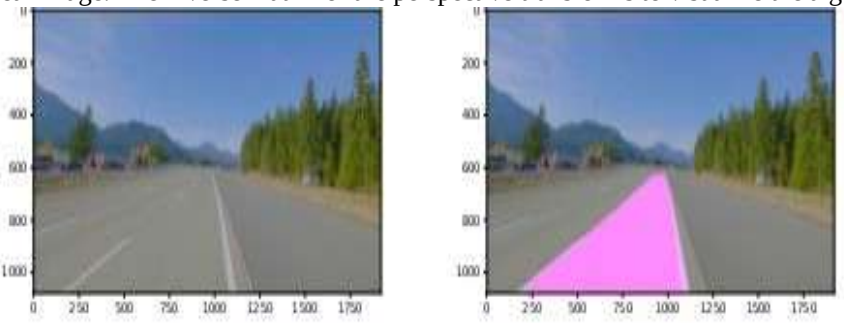

Fig 4.1.5 Lane Detection

4.5 Road Sign Detection

When developing an autonomous vehicle, it is important to identify and detect traffic signals signs with high accuracy. Otherwise the result will cause some major issues. While travelling your self-driving car, you may have cross traffic signals, speed limit signals, turn signal (left, right, U-turn), stop signal and so on.In road sign detection, you can achieve it by using the Convolutional Neural Network (CNN) using keras. It is simple and easy, just follow the steps, (52)

A convolution layer has many filters that are commonly used to detect the low-level features known as edges of a faces. To extract the input, CNN have consisted of a series of convolutional and pooling layers in the neural network. To decrease computation the pooling layer does dimensionally reduction and it also extracts the ruling features by avoiding the side pixel. Preprocessing images helps in extracting the complex features of the image and give very accurate results(53).

- Open CV has some built-in functions like cvtcolor() and equalizeHist(),
- Using the cvtcolor() function, the images are converted to gray scale images for reducing computation.
- To increase the contrasts of the image by normalize the intensity of pixel using the equalizeHist().
- Finally, the pixel values between 0 to 1 is dividing by 255

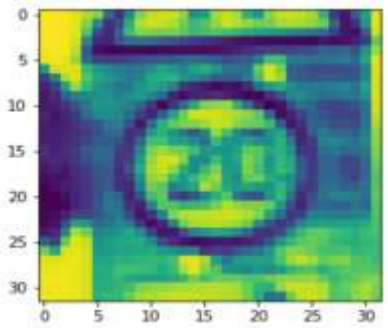

Fig 4.2.1 Sign Detection

5. RESULTS

The Lane Detection and traffic sign recognition system, modules were performed. Captured video for the road sign recognition module contains the total 200 signs and it includes traffic signals, numerous signs, urban, and motorway scenes. The results for the road sign recognition module which has achieved an accuracy of 90% on test image. The proposed method will give the effective result for detecting the lane and curve of the lane and corner of the lane. In lane detection we can get some flaws like cross walks, cross streets, near passing cars. In road sign recognition, it can give effective result in high noisy, bad conditions and snow. Here autonomous vehicles by using the lane detection, road sign detection, and curved lane detection over the different lanes and the data. In self- driving car, years of testing and approval will eb required before to implement into the market.

6. CONCLUSION

In future autonomous vehicles will be sufficiently reliable, comfortable and common usage among peoples. Its providing benefits a savings considerable thing in self-driving car is it can operate frequently in mixed urban traffic, heavy rain and snow. While driving autonomous vehicles on public road is very risky because un-predictable animals, cyclists, children's, frequent interaction with others. Most companies are financially investing money in autonomous vehicles, based on experience with disruptive technologies like cameras, smart phones and personal computers.

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