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Lane Detection based on Adaptive Threshold Segmentation and Road Classification

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Abstract: ***The Curves are the accident-prone areas in the traffic system of the constructed structural road. To effectively recognize the lane-line and timely give the traffic of organized information for drivers is a arduous points for safe driving. Thus, the curves recognizing algorithm which is based on straight-curve methodology is proposed in the project and the methodology has best applicability for many curved-road conditions. Firstly, the method splits the road image into the region of interest and the road background region by analyzing the basic characteristics of the road image. The area of interest is further cut-up to the straight region and the curve region. At the same time, the straight-curve mathematical model is accepted. The mathematical form of the straight model is acquired by using the developed Hough transform. The polynomial curve model is entrenched accordingly to the flow of the road lane-line and the tangent relationship between the straight model and the curve model. And then, the parameters of the curve model equations are solved by the curve fitting methodology. Finally, the recognition and spotting of the straight region and the curve region are realized respectively and the road lane-line is reconstructed. Experiments and implementations show that the methodology can accurately recognize the curve lane-line and provides effective traffic information, make early warnings and it also has a certain universality.***

Keywords: Curve Detection, Python, Turning Radius, Parameters, RANSAC Algorithm, Object Detection.

I. INTRODUCTION

The rapid growth of the highway transportation system, the number of car ownership has risen year after year which is result in serious traffic conditions. In particular, the incidence of curve accidents and the seriousness of accidents remain high. When the car is turning, there will be a blind zone of sight which is accompanied by increased centrifugal force. The turning radius will decrease and the lateral sliding will occur easily, which is caused collision accidents. In Japan, the traffic accident rate on the curved sections of the road exceeded 41.01% of the total accident rate, while the number of traffic accidents on the curved road in China accounted for 7.84% of the total accident. Judging from the severity of the accident, the fatal accidents of the curve occupies 16.3% of all fatal accidents. Other statistics show that the main reasons of accidents in the curved areas are the over-speeding of the turning vehicles during turning, irregularly overtaking lane change and lane occupancy. During driving, many accidents occurred due to driver's inattentiveness or unfamiliarity with the road ahead, especially at the curved road which is the place of the high incidence of accidents. Therefore, if it is possible to detect and recognize the road ahead before the advent of curved road conditions, warn the driver in advance, slowdown and avoid evasion in advance, many unnecessary accidents can be avoided and the safety of life and property can be guaranteed.

II. LITERATURE REVIEW

The Intelligent Transport System (ITS) is having a primary goal of a road safety. It is providing a promising way to alleviate traffic accidents giving ability for vehicles to communicate with each other. As the human reactions are taking much more time to response any sudden activity. The ITS is trying to overcome these problems by providing systems to reduce the response time. In Addition, the complications that are present ahead are also taken into consideration. As the information regarding the future complications is the need of the drivers. This is needed the driver assistance so as to induce sudden breaking or limiting the vehicle speed for further accidents, especially in the high alert zone or at the blind curve or S-curve roads which are prone to accidents. Such roads, we mostly found in the hill areas where the roads are designed by extracting the hills. The road architecture in the hill area is also not having much more space to extend the road infrastructure as concerning to the geological parameters such as soil conditions, rock type, etc [2]. The highways are the most contributing for this work, as the number of accidents in our country are mostly found on the highways. These include the National highways which are joining the metro cities of our country. The survey has been presently done for the curve roads present in the Dhanaulti (Uttarakhand), Pachamadhi (Madhya Pradesh) and Chikhaldara (Maharashtra). While visiting to those places, the roads which are available are having very tedious combinations of S-curve roads and Blind-curve (i.e. U-curve). Due to such a road structures the proning to accidents are more as the drivers who are exiting are having very limited visibility for both the directions.

Earlier the blind curves area has been negotiated as the worst case scenario in the mind while designing the roads as well as traffic rules for the region of curve roads in our country. This is the main reason for increasing the number of accidents on the hill area, blind curve and S-curve roads. Also the main causes for those accidents are the present sign boards system. It is found that at most of the places those boards are not present and if present, it is not in the proper condition to assist the driver for the next occurrences of the road diversions. These sign boards present are not been providing a proper information to the driver. This is because they are just placed at a distance of 10-50 meters from the cliff edge of the turns. Because of such provision of information the driver with relatively high speed (e.g. vehicle coming from upper side of hill) having more chances to meet the accident. Thus we are trying to propose such a system which will be a digital display. The provision of digital display will might give result in less number of accidents. This is because it is visible from longer distance, so as the driver get assisted properly before visiting to the curve road or blind spot. In the display board we are trying to provide the parameters like direction, speed and distance of nearer vehicle coming from opposite side (at least 50 meters/feet's) and the density of the vehicle in the particular area (at least 300 meters). This might be reducing the accident chances on the blind curves and blind spots. The existing work for the blind spot detection with the contribution of ITS is discussed in section III.

III. EXISTING SYSTEM

The model-based methods are based on the specific geometric model, and parameters are determined by analyzing the target information in the road image. It has good robustness for the lane-line is worn, blurred and interfered. So the select of the model and the solution of parameters is the key for the problem. For more complex lane detection, it can be better solved with other related technologies. The literature proposed a layered lane detection algorithm by classifying lane type of lane-lines and then the corresponding lane detection algorithms are used. The literature proposed the method that convolutional neural network (CNN) combined with RANSAC algorithm to detect the lane-line. The method is a new thought for lane detection field and it successfully eliminate the interference lines, and also it has better performance compared with RANSAC algorithm. The literature introduced the lane-line detection algorithm which is based on fully convolutional neural network (FCN). The method doesn't use time-domain information to detect the lane-line and it doesn't have the universal applicability. Due to these methods, which is based on other related technologies, are uncertain, the main method of the lane detection is the model based method and the feature based method.
The lane detection technology has great significant influence for improving the vehicle's active safe driving and assisting driving. At present, there are three types of approaches used for lane detection. The feature-based methods are usually applied to localize the lanes in the road images by extracting low-level features. The literature used the color clustering method for lane-line detection. The method converts the original RGB image into the Lab color space, then uses the clustering algorithm to extract the lane-line in the Lab color space.

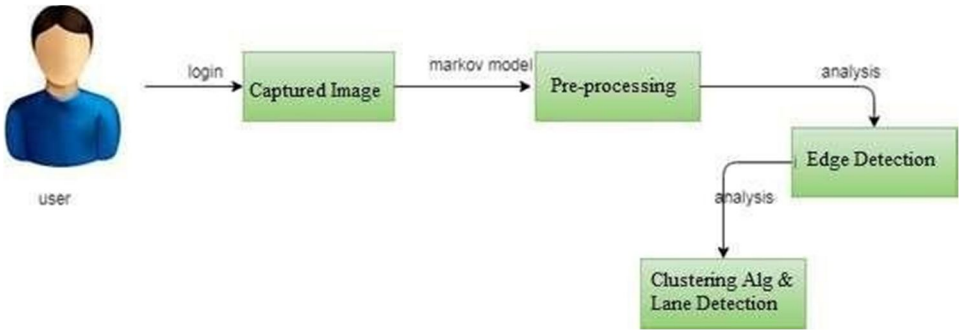

Fig 1 System Architecture

IV. PROPOSED SYSTEM

The demonstration of our approach enables successful segmentation of intra- retinal layers — even with low-quality images containing speckle noise, low contrast, and different intensity ranges throughout—with the assistance of the ANIS feature.
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Table 1. System requirements

PROGRAMMING LANGUAGE	Python
PACKAGES	Tensor-flow, Numpy, Pandas, Matplotlib, Scikit-learn
TOOL	TOOL
OPERATING SYSTEM	Windows 10
PROCESSOR	Intel Core i3-2348M
CPU SPEED	2.30 GHz
MEMORY	2 GB (RAM)

The contribution to the proposed work is elaborated by taking the few parameters into considerations which will be the useful to work on its various phases. These parameters are included in our proposed system work because if a rider is approaching to the situation they are observing and riding accordingly, there will be enough time to react. Or else, he will be facing and might be suffer from a nasty surprise as rider merely seeing the curvy road and not observing the true implications on it. The various phases are taken into considerations according to their parameters and by considering every vehicle as a node they are discussed as:

1) *Tracking Phase:* In this phase, we are trying to get the information about the vehicle size and categorized it. This is because it is found that the most number of accidents are faced or happened due to LMV (i.e. cars) which are crossing the lanes at the curves with relatively high speed resulting into the over sliding [8]. This will be done by using the pressure sensors deployed at the distance of at least 50-120 meters from the curve. At the same place, we are providing with the actuators which are deployed in a group. These actuators will be in work for the vehicles that are exceeding the speed limit of the road at the particular curve due to which the chances of accidents are increased [9]. These actuators will track the information of the vehicle speed. If it is above some threshold value (e.g. 22-27 km/hr), the actuators will come above the road surface and give vibrating effect to the driver. So that he has to less down his speed before he will visit to the blind spot on the curve road.
2) *Neighbors Discovery Phase:* In this phase, distance between the two vehicles is the main parameter to concern. The status of the sensors is having a vital role in this phase [10]. The sensors will give the distance between the two nearest vehicles that are coming in opposite direction. This information is also made available so as to warn the drivers if they are having exceeded high speed [11]. This contribution will help in making the rules for the traffic system in the rural as well as urban area.

V. RESULTS

According to the method of section VI.B, the recognition results of the lane- line bending direction as shown in Fig. 15. The green line in the image is the preliminary lane-line reconstruction result, the red line is the extension line of the straight line in the near view region, and the red text on the left side of the image represents the bending result.

Fig2 Curve Direction

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VI. CONCLUSION

This paper proposed the lane-line's detection algorithm which is based on the straight- curve model by establishing the model of the straight and curve and analysing the characteristics of the road image. It can better solve the accurate detection of lane- lines and it has great significance in practical applications. The experimental results show that the algorithm can accurately identify the road lane-line and give the deviated information of vehicle and the direction of the curve. It has great significance to improve the active safety driving and assisted driving of the vehicle which is in the curved road conditions.

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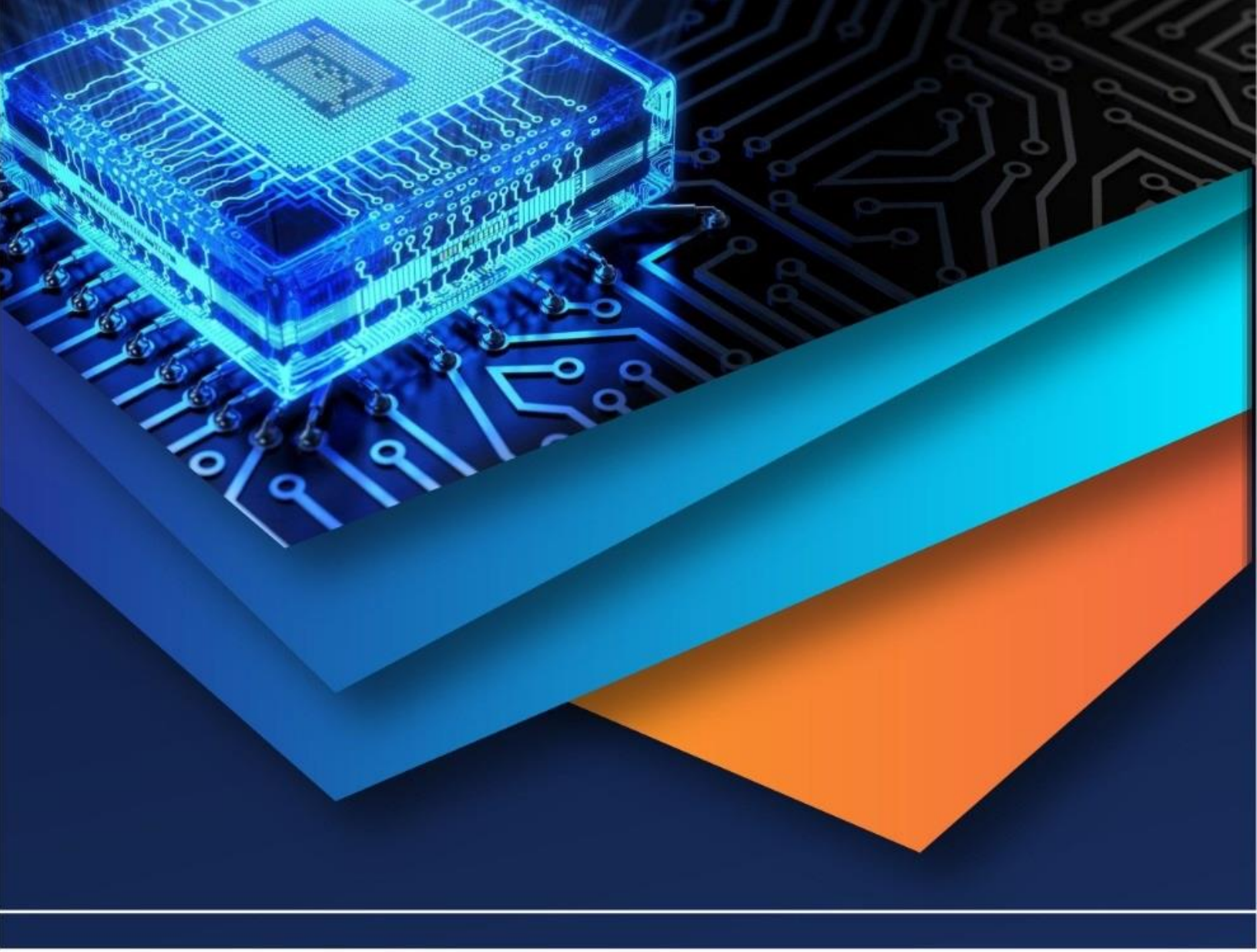

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