Computer Vision based Intelligent Lane Detection and Warning System: A Design Approach

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Abstract – In Intelligent Transport System (ITS), prevention from accident is one of prominent area of research in which various approaches are implemented and proposed to assist and warn driver from accidents. As a part of warning system lane departure technique is widely considered, that monitor vehicle's movement , and warn driver before lane departure which will prevent driver from head on collision. Hence it's a matter of motivation for developing such a system which can detect lane marks on road and warn driver on any conditions. Due to variety of availability of tools and techniques, several methods where proposed by different authors which are discussed in this paper with their pros and cons that will help us to decide better one according to one's specific conditions or need

Index Terms— *Intelligent transport system ITS, lane Departure warning (LDW)*

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I. INTRODUCTION

When we talk about the vehicle safety Intelligent Transport System is a major part in the area of vehicle safety. Today ITS is totally changed the whole vehicle system such as Traveler Information system, Traffic Management System, Public Transport System, Electronic Payment Services, Vehicle Safety and Control System, Track Vehicle Information System and so many advanced technique which are continuously implemented. Intelligent transport system is a very big domain where lots of work is going on with many parameter such as security, vehicle to vehicle communication, The basic thing is that how intelligently we can use the transport system and one of the major and important thing which to be consider is the vehicle safety.

[A] Lane Departure Warning System

The one of the safety technique which is implemented when the vehicle is crossing the road lane is lane departure warning system. As the name suggest when the vehicle is crossing the road lane or near the road lane automatic signal is generated and warn the driver so that the possibility of road accident is reduced.

Lane Departure Warning System as the name suggest the car is going on the road and the camera continuously tracking the actual lane marking and so that when car is just crossing the lane the sensor sense the actual line and send the warning signal to the driver so that it can prevented from the accident.

There are so many research is done in this field. When we talking about the lane departure warning system there are so many ways in which this is used. Basically the camera is continuously capturing the lane marking. The warning system estimate the distance from vehicle to lane if the vehicle is near to the lane it cannot create the warning but if it is crossing the distance which is set by the warning system it alarm the driver. Basically this method is used when the car is going with very high speed on the highway so that it can prevent from the accident.

[B] Lane keeping assistance

In some advanced technique the warning signal is not used and the vehicle is automatic is moving far from the lane this technique is called lane keeping assistance. This technique is similar to lane departure warning system but in this technique if it sends the warning signal and driver is not responding the warning signal it can automatically change the direction of the vehicle that so that it can prevent from the accident.

II. APPROACHES

There are so many different technique currently used in the research area of lane departure warning system. In this one is to be used is the camera capturing the image and it is processed for detecting the vehicle crossing the lane and verified it and the second is Neuro fuzzy Network for lane detection some have design.

In 2013, sayanan and trivedi[1] as proposed a Synergistic Approach for lane marking, they have worked with the inverse perspective- mapped (IPM) image of the ground plane. The standard camera calibration is used to calculate camera's intrinsic parameters which in turns generate a ground plane image and a Real-world points lying on the ground plane are mapped into the camera's frame of reference using a translation and a rotation the flow chart of process is depicted in the below fig.

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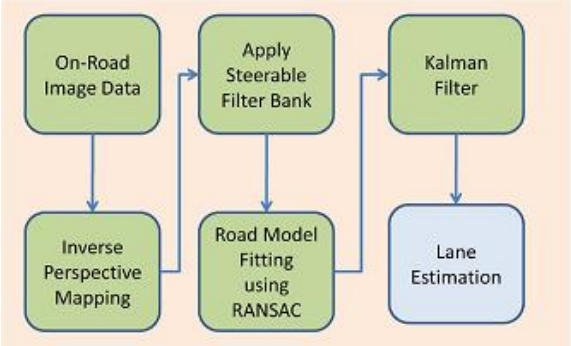

FIG. 1. Lane tracking framework by Synergistic Approaches[1]

Some have proposed [2] systems which give more emphasis on various traffic situations. Its basic part of analysis is to detect components of environment thoroughly, through which a decision system is developed. This decision building system is capable of giving output in the form of warning and corrections for drivers by supported actuators that are connected with control strategies. Camera will give inputs which are supported by sensors (such as laser scanners and radar) and precise vehicle-positioning, digital road maps and vehicle dynamic data. Their presented system depicted in the following figure

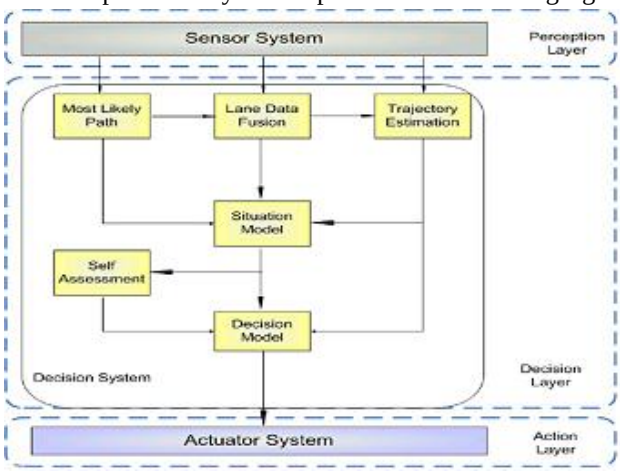

FIG. 2. Structure and modules of the SAFELANE system.[2]

In 2009, [3] an embedded Advanced RISC Machines (ARM)-based real-time LDWS was proposed in which peak finding method was used for detecting lane boundaries and a spatiotemporal mechanism was used for generating warnings In addition, there observations shows a high accuracy in day as well as night.

Fig. 3. Concept of A Portable Real Time LDWS.[3]

In another paper [4] researchers have considered highly sensitive road conditions where the LDW system fails to detect lane markers on the road ways which results in loss of control over warning generation system. So for avoiding such problems they have proposed a system with combination of GPS with inertial sensors and a high-precision map for helping vision based LDW System. This method plays a role of backup system of measurement for lateral offset that can be used for LDW when LDW vision system will not work properly.

By extending vision system further some have proposed [5] "video-based lane estimation and tracking" (VioLET) system. In this the system uses steerable filters for robust and correct lane-marking detection. Steerable filters are very efficient as by following only three steps of convolutions we can extract an extensive variety of lane markings. It uses multiple quantitative metrics over a wide range of conditions in the form of several parameters to evaluate reliability, robustness and accurateness of system. It has considered a wide diversified set of timings (in between early morning to late night or road conditions during rainy, cloudy seasons and in sunshine atmosphere).

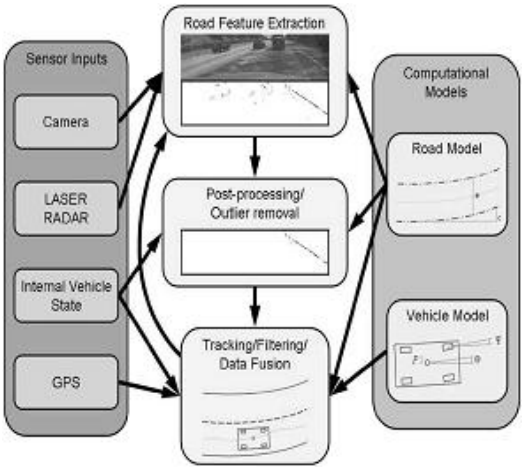

FIG. 4. Generalized flowchart for lane-position-detection systems combining multiple modalities, an iterative detection/tracking loop, and road and vehicle models.[5]

III. METHODOLOGY

1. **Video image acquisition:–** First of all we have to capture the road image from the camera when the vehicle is moving by capturing the image we our vehicle is in the path or not. .
2. **Image processing(resize) :-** This is very important task because when we capture the image the size of the image is very big hence for processing purpose we have to resize the image for fast processing
3. **Image conversion: –** Image conversion is nothing but the conversion of RGB to intensity in which the whole color image is change blank and white that means we capture only the white lane marking and remove the unwanted picture.
4. **Statistical Analysis: -** Statistical analysis is nothing but the to find out the mean,median,variance,standard deviation,max ratio and min ration. So actually identified the basic requirement for particular image we have to adopt all this thing.
5. **Neural network** :- After the statistical analysis we use the neural network for processing the image.
6. **Warning Signal**:- This is the last step in which the warning signal is generated and it can the driver. It may be Warn through Audio visual or through Display

IV. IMPLEMENTATION PLATFORM

For implementing this methodology we have to use the neural network toolbox we can also implement this methodology through the use of fuzzy logic network.

V. CONCLUSIONS AND FUTURE WORK

In this paper we have discussed about the approaches for lane departure warning and its need. We have studied so many research papers and their different technique about lane departure warning system. For our system we consider the neural network as compared to image processing.

In more existing way we have to develop the real time approach to which the future smart car is adopting it very much.

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