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Road Lane Detection and Tracking

Aleena Varghese[1], Anju P[2], Elizabeth Thomas[3], Ashly Roy[4] and Willson Joseph[5]

Abstract:- For humanity mobility is an important economic social factor. Since it provides the quality of life for the individuals and basically it is one of the backbone for the commercial trading and services. Here, we describe a method by which the lanes in the road is being tracked, for the driver less car, including with the features of detection of traffic light and the recognition of the pedestrian. In order to provide the above features we adopt the techniques of image processing and machine learning in artificial intelligence. The image is captured and processed from the real world scenarios. Among the features taken from the captured images, we can calculate and extract the required information for a driver less car to move in a road by recognizing the pedestrians, traffic light and also by keeping the lane and directions. This strategy will show good accuracy levels and can be implemented in our vehicle system, since we the world is now moving to the advanced driver assistance systems.

I. INTRODUCTION

On this increasing population scenario it is the basic important factor for the road safety measures such that the number of human lives can be saved and for this we introduce an Advanced Driver Assistance System. Now a days the accidents are increasing due to the human error. One of the major task is for tracking the road lanes for the upcoming future vehicles. Road lane or boundaries detection is one of the most difficult and challenging task in future, which plays the main role in this scenario.

The key component of collision avoidance is obstacle detection in DAS system. Laser, vision, and radar sensors are most common sensors used in this obstacle and lane detection of the moving objects. The principle behind this approach is vision system, which is used for detecting road boundaries and lanes. The method used for this purpose is IPM (Inverse Perspective Mapping). For detecting the lanes and objects we use a camera, which is fixed on the vehicle and then have some of the steps to be performed for geting the front view. For improving human safety man concentrate on more innovative technologies. Seat belts, strong body structures, and air bags are some of the passive safety measures which are provided by the automobiles for reducing the spontaneous effect of an accident.

The main vision of automobile companies and researchers are to provide safety for humans by avoiding the accidents. For providing better driving and safety we use a system which is Advanced Driver Assistance System (ADAS). This device helps in enhancing the driving experience adapt and automate. The main causes of accidents are due to human errors. This system helps t ensure the safety and to reduce the workload of the driver. This system works based on how the situations are occurring such as when it is before a sudden hit either the system will takes the necessary action or warns the driver. The most important module in an Advanced Driver Assistance System (ADAS) is Lane Departure Warning(LDW). In this method the camera is placed at the back of the wind shield of the vehicle for capturing the road images.

The interpreted lines in the roads and lanes are then identified using this system. Warning is provided to the driver when the vehicle is moves out of the lane unintentionally. On the turn signal the system will get disabled. The initial steps of lane departure warning system is lane marker detection and for this purpose there are mainly two methods that is to be followed and these are model based and feature based approach. In the model based approach it uses the geometric parameters for detecting lanes whereas the feature based approach uses lower level features such as the edges. Lane appearance diversity, changes in visibility conditions, variation in clarity of images are some of the main challenges and issues which is faced by the lane departure warning system. The lane markers used will be different for different countries. For solving the lane detection and tracking problems we have to investigate the type of lane behaviours and the challenges faced during the time of tracking. Special colours are used for marking the reflectors lane whereas lane markers are usually marked with white and yellow colours.

For different countries width and number of lanes will be different. Due the presence of shadows there can be issues which will be related with the clarity of the images. There may be some issues in the visibility of lanes due to nearby vehicles. There will be unexpected changes in the illumination when a vehicle comes out from a tunnel and thus it causes the clarity of the images due to the sudden changes in the illumination. Some of the environmental factors such as fog, snow, and rain are the reasons for decreasing the visibility of the lane markers. And also during the time of night the visibility of lane markers will get reduced. A robust NGPP (Near Ground Point Projection) method is used firstly for the ego-motion of host vehicles to detect various moving objects such as vehicles and pedestrians. For detect fast motion and slight motion in the bird eye image a novel point based moving object detection method is proposed.

In order to filter out the false detection result a region based motion compensation method is used, which is caused by the error matching points. Since

sensors are providing more information about the scenes this gets more and more popularity. With a limited views and fisheye cameras the vision sensors can be divided into normal cameras. Due to latter have much larger field of view it has wider application prospect in parking assistance systems and backup aid. The feature-based object detection algorithms are often used in driver assistance systems using visual sensors for detecting some specific kind of objects such as vehicles and pedestrians. When the appearance of the objects are known beforehand and not change much this kind of approach can be used. All kinds of obstacles can possess potential threatens to host vehicles in backup aid applications.

Therefore this algorithm is not much suitable. IPM (Inverse Perspective Mapping) method is used for detecting all kinds of obstacles on the road such as pedestrians and other vehicles systems. The principle of vision-based detection is one of the methods which is used in lane detection. It is a process of recognizing as well as detecting the lanes where the ground traffic circulates. To perform the functionalities of lane detection there must use some specific terms that implies the certain algorithms, certain processing units and the utilization of certain perceptive sensors. The lane detection is effected by many factors and it is also an essential function of advanced driving assistant system. The shadows of trees buildings, other aid boards can be affect the good quality of lane. Also the change of light condition, the dirt left on the road surface, the existence of the surrounding objects, etc can cause the damage to the quality of lane. There are some problems regarding with the detection of the road lane marks which are still existing.

The detection should have the capability of assuming the curved roads instead of straight roads. The noises in the images can be improved by assuming the parallelism of both side of lane marking which will helps in the balancing of the image. Since all these methods exist there will be difficulties in detecting these lanes and also many research works still continue on these detecting methods. Improving the SNR plays a vital role. In the process of detection as computer vision it improves the quality of image frames and avoids the blurring of videos. Here we use SNR improvement which can collaborate both road boundaries and objects. Cameras placed on the vehicle, in the form of series of images are detected. Thus received data will be noisy data. In order to reduce the noise we will pass the series of images through certain filtering and modelling process, so thus obtained result is the improvement in SNR. The increases the quality of the image which will be very effectively used for further lane and object detection.

There are many sources for the video acquisition in the field of signal processing the main important one is vision-based approach. The camera which is having capability of tracking of structured rod boundaries such as painted or unpainted lane markings with slight curvature which is robust enough in presence in shadow conditions and reaching real-time performances in detection is fixed on the vehicle. The object detection algorithm used by the rear view camera helps the detection of moving object when the vehicle is passing it also very effectively backup aid. Also it can be used for parking assist application. The area of computer vision with applications to driver assist systems and autonomous vehicles is well researched for lane detection. It is difficult to identify white marks on the road when these are apparent simplicity of white marks on the road, these can be done due to the shadow of the other vehicles different type of road markings and due to the changes in the roadway itself all these on the dark roads can create more difficulties in this mechanisms. The details which have to be included in a good lane detection system must include all types of markers roads confusion and reliable estimate path of vehicle position. The most important feature in a driver assistance system is lane detection. Lane detection helps to estimate the geometry of floor and lateral position ego vehicles on the road. Also it localised lane boundaries in images of specific path.

The edges of roads, lane markings detection and estimation of the vehicle position in the lane can be detected using lane detection algorithm. The framework of lane detection supports vehicle detection as function of many other single-camera based Mobil eye function. By these mechanism the Correct position of the vehicle can be obtained in the same lane. While executing this process there will not be any sort of problem with the visibility of markings in the roads. Also by the presence of cluster their testimony will not be hindered and some of the disturbances such as rain, snow, shadows etc will not effect the visibilities of the lane in the road. Majority of markings in the world such as fellow, white and blue can be recognizes by LDA and the 99 percentage of cases are done approximately through Mobil eye system.

Dashed marks, boot points and solids are different types of marks which are integrated as production successfully that are double and triple road markings. Also grass or gravel banks are identified or recognized by the LDA. Also it uses on the adjacent track and refine the OEM requirements and also to support the strategy of caution. The variations found in different countries meet correctly and the system has been refined and adapted and it will developed a system of permits for better road markings double , triple, ambiguous markings etc. The color information can also used by the authorization mechanism for better separation.

Today we observe an increasing demand for traffic safety systems to minimize the risk of accidents. There are a large number of vision based systems for lateral and longitudinal vehicle control, collision avoidance and lane departure warning, which have been developed

during the last decade around the world. The development of advanced driver assistance systems and ultimately autonomous driving requires the ability to analyse the road scene. One prerequisite for this is the detection of lanes and subsequent tracking of lanes. Lane detection is the problem of analyzing a single image and determine the lane markings. Lane tracking is process of using temporal knowledge in lane detection. Tracking helps in reducing the computational burden whilst improving robustness. Large numbers of research work are reported in the literature, which effectively solved the lane detection/tracking problem especially for highway like situations. However, they have shortcomings to be used in urban road scenarios.

For the outcomes, the inhabitants of industrialized countries have achieved a high degree of mobility due to the mass production of vehicles and road infrastructure investments.

However, the popularization of automobiles has caused some logistical problems, such as traffic congestion and the increase of the risk of accidents [2] [3]. According to data from the National Highway Traffic Safety Administration (NHTSA), 94 percentage of the critical flaws in the chain of events preceding an accident are assigned to the driver, which justifies the investment in support systems [4].

Driver Assistance Systems (DAS) offer solutions to reduce the effects caused by the above-listed problems. Bengler et al. [5] have been analyzing over the past three decades the future perspective of DAS development, and structuring it according to the technological point of view:

From the late 1970s to the mid-1990s: The early systems were based on proprioceptive sensors to stabilize vehicle dynamics, such as ABS (Anti-lock Brake System), TCS (Traction Control System) and ESC (Electronic Stability Control); From the early 1990s to the late 2000s: Exteroceptive sensors based systems with information, alarm and comfort functions such as LDW (Lane Departure Warning), ACC (Adaptive Cruise Control) and Park Assist;

Volvo Trucks [6] conducted a study about European road accidents which associates 22 percentage of the accidents involving trucks with lane departure or rear-end collision. According to the Federal Highway Administration (FHWA), 54 percentage of traffic accidents fatalities in the year of 2014 were caused by the vehicle departure from its driving path [7]. Therefore, regulations and programs to evaluate automotive safety performance have reinforced DAS development. For example, NHTSAs requirements for the deployment of rearview technology on all new light-duty vehicles manufactured in the US by 2018 [8] and the EURO NCAP (European New Car Assessment Program) classification system, which makes public the safety ratings in European manufactured vehicles [9].

This work presents a novel strategy for road lane detection and tracking based on vehicles forward monocular camera, which enables the driver assistance applications such as LDW and LKA.

A. Problem Definition

The increase in the risk of accidents and traffic congestion has caused some logistical problems in the popularization of automobiles. While considering the latest data from the National Highway Traffic Safety Administration (NHTSA), which justifices the investment in supporting system that is by showing that the 94 percentage of critical flaws in chain of events preceding an accident which are assigned to the driver. The above-listed problem can be avoided or can reduce the effect of these problem by offering the Correct solution through Driver Assistance System (DAS).European road accidents where learnt by volvo trucks which associates 22 percentage of accidents which involves the rear-end collission or trucks with lane departure. The 54 percentage of traffic accidents fatalities in 2014 of the year were caused by the departure of vehicle from its driving path according to the Federal Highway Administrative (FHWA). Hence the program to evaluate automotive safety performance and regulations have been developed reinforced DAS. Thus this work presents the tracking based on vehicles forward molecular camera and a novel strategy for road lane detection, which enables LDW and LKA like driver assistance application in order to avoid the deficiencies of existing system.

B. Motivation

Nowadays researchers are working behind the new technologies on the features of driver assistant system in intelligent transportation system so that they are able to ensure safety on the roads and congested traffic systems. The sudden death on the world today is due to the road accidents and now many of the humans lose their lives. Even though we have many good and advanced techniques in this world, we are left over with something to make it better than before. There are chances from different angles. The road lane detection and object detection is also the other important way that we can improve the safety in roads.

In Malaysia and Asian countries the leading cause of accidents death and injuries are due to the vehicle crashes that are claiming injuring millions of people each year and taking tens of thousands of lives. The national highway has to face the most of injuries and these transportation deaths. Registering an average of 4.5 deaths per 10,000 registered vehicles and with the highest number of fatal road accidents the United Nations has ranked Malaysia 30th among all other countries. It is not only limited to one country most of the traffic-congested countries like U.S, India, other

Asian countries have many calculation of deaths and injuries.

In intelligent transportation systems with improved technologies, the vehicles are made more sophisticated with better infrastructure. But the way to move on the roads by means of lane and object detection aspect is neglected by many automobile companies and the ways to improve these aspects does not change from many years. Lane detection and object detection plays vital role for accidents. For human vision and human intelligence the task of lane detection and object detection changes due to variations in the road conditions. Sometimes it is very easy to detect with the human eyes but in some conditions due to externals effects the human intelligent have detection problems.

Due too many external conditions that appears for the lane detection and obstacle detection which may lead for the accidents. They are conditions such as appearances such as change of Light conditions at Night vision, shadows caused by building and trees, existence of surrounding objects, Mismatching of lanes, and lane changes in curved roads.

The major motivations are:

(a)The Road Safety - On reducing the human driving errors we can improve the road safety so that the accidents can be reduced.
(b) Traffic Management - Making more effective for the traffic flow management, convenient time efficient driving via automation.
(c) Reducing Emissions - This helps in the reduction of the fuel consumption CO2 emission.
(d) Demographic Change - This will helps to support the unconfident drivers. and also enhances the mobility for the elderly people.
(e) Innovating High technology -This includes the new economic paradigms and supporting for the innovative policies of regions and nations. Competitiveness / high skill employment

C. Objectives

Modern technologies are nowadays wide-spreaded everywhere in all corners of the world. So to use this advanced technologies we are implementing many more options.

The aim of this work is to avoid accidental deaths and provide a better safety on roads, by use of advanced technologies in driving assistances system.

For presenting the users with a strategy for tracking the road lanes and for the detection by including the DAS features for the effective driving for preventing the road accidents.

II. CONCLUSION

As a result the outcomes which we get from this experiment is up on the items which we collect from the current scenario of the road environment in which the images of the vehicles and signals from the vehicles are captured by a monocular camera which is fixed in a commercial vehicle windshield and instrumentation of the data bus. For the tracking purpose of several ROI sizes we use IPM algorithm, and that allows the range determination. Based on the lines which we obtain from the analysis we could find the distance that should be kept in order to prevent from accidents. If its about 100 lines that is about smaller the ROI, then, ahead of the vehicle, it covers about a range of 10.4m and if its 150 lines that is about largest the ROI, then it covers a range of 34.5m, ahead of the vehicle. On considering the average reaction time for braking, before the reaction time of the driver, for avoiding collision with a static obstacle in front of the vehicle, then the minimum ROI which should be needed is 120 lines and it covers about 14.4m. On analysing the results from the algorithm, it is able to detect the scenarios where the tracking of the algorithm is more confident and it was able to detect the environmental conditions or highway patterns where the tracking is unstable. The visibility of the lane markings was noticed that it should be compromised by some of the factors, such as the shadows, the worse effect from the paint, reflective nature of the lane and the glare from cameras. The bad performance was observed in the double marked lanes in which it is with the inner lane dashed and the highest assertiveness were observed in the tracks with the continuous lane markings. Due to the fluctuations in the tracing, this creates the highest absolute mean error among the samples which was collected that is between the external and internal part of the marking.

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