DRIVING AUTOMATION MODEL ON SHARED STEERING CONTROL SYSTEM FOR INTELLIGENT VEHICLES USING LABVIEW

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Abstract

Now-a-days the automatically controlled by increasingly implemented for vehicle control system. In this paper the shared steering control frame for the obstacle avoidance and stability control was discussed. The main objective of this project is to avoid accident that occurs in NH road. In the existing system there is no fully automatic steering control and it has serious problems. When it is made automatic the system complexity is more. So the shared steering concept is used in the proposed system to avoid accident. Based on the road pattern and the obstacle present on the road is found using web camera installed infront of the vehicle which is connected to the pc installed with LabVIEW. Using LabVIEW the image is processed to check the road characteristics. The system improves lane keeping performance and reduce the risk of accidents this project help us to overcome from accident reporting.

Keywords – LabVIEW, Shared steering control, Vehicle control system.

I. Introduction:

DRIVING is a dangerous activity that can have serious human and economic consequences. According to the statistics, unintended lane departure is the second most frequent type of single light-vehicle accidents. In many cases, the accidents can be attributed to degradation in driver performance, which is caused by such factors as fatigue, drowsiness, or inattention. This fact has motivated major research effort aimed at helping drivers and improving safety, particularly through the use of active systems that have the potential to prevent vehicle accidents. Several advanced assistance systems have been proposed over the last decade to improve vehicle lateral control. Some of them are based on the principle of mutual control between the driver and the automation system. The challenge in designing such human–machine interaction is how to combine the adaptability of humans with the precision of machines because manual control tasks are prone to human error, and fully automated tasks are subject to wide-ranging limitations. Shared control, that is the transitional stage of intelligent vehicle from manual control to full automation, is defined as the situation where a driver and computer can carry out the task simultaneously. *Several advanced assistance systems have been proposed* over the last decade to improve vehicle lateral control. Some of them are based on the principle of mutual control between the driver and the automation system. The challenge in designing such human–machine interaction is how to combine the adaptability of humans with the precision of machines because manual control tasks are prone to human error, and fully automated tasks are subject to wide-ranging limitations. Recently, an alternative solution, known as haptic shared control or haptic guidance, has received increased attention. In the shared control paradigm, the machine’s manual control interface is motorized to allow both a human and a controller to be able to exert control simultaneously. In such a setup, the haptic interface can sense the action of the operator and feed the forces back to him. Shared control has been investigated for a wide range of applications, e.g., in the control of automobiles and aircraft, or during tele-operated control to support object manipulation, surgery, micro assembly or the steering of unmanned aerial vehicles.

II. EXISTING SYSTEM

In existing system there is no fully automatic steering control and many accidents occur due to this issue. It has serious problem when made automatic the system complexity is more and when it made manual the system reliability depends on the drivers awareness. Everyone has lapses in judgement, but when behind the wheel of a car, those clouded instincts can be deadly. You can turn down a street thinking it is a normal right turn, when in actuality, it is a one way street in the opposite direction. When you go the wrong way, everyone is in danger because as you head towards a car accident. The reason that we have stop lights, turn signals and lanes designated for moving either left or right as opposed to straight is because when drivers ignore the rules of the road, car accidents are often the result. To prevent car accident, always look for signs and obey the proper right of way before you make a turn.

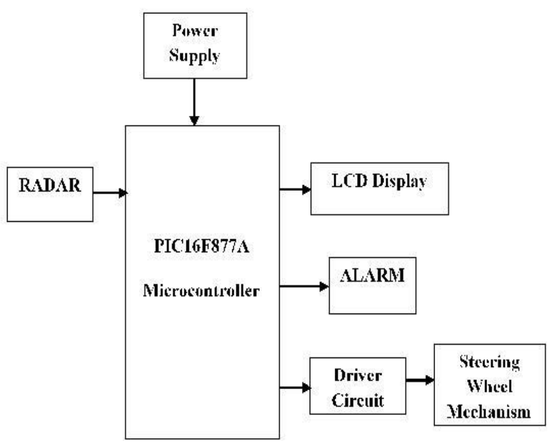


Fig 1: Existing block diagram

In existing system, there is no fully automatic steering control. It has serious problems. When it is made automatic the system complexity is more. And when made manual the system reliability depends on the driver's awareness.

DRAWBACKS

The drawback of existing system is the road pattern is not recognized by system and the curves of road need manual control.It is suitable only for long and straight driving.

2.1 Existing system survey – A review

In the past, Lateral Stability Enhancement of Vehicles Using Adaptive Sliding Mode Based Active Front Steering and Direct Yaw Moment Control. The active front steering and direct yaw moment of a vehicle are proposed to be controlled simultaneously to improve its stability. Two structures are used in this control strategy named as the upper and lower levels of ontrol. The adaptive sliding-mode control (SMC) technique is used in the upper-level control in order to generate the corrective steering wheel angle and yaw moment. The realization of the yaw moment is done through braking between appropriate wheels in the lower-level control. Lyapunov criterion is introduced to prove the stability of the sliding mode controller. Tracking performances of yaw-rate and side-slip angle of a Sports Car is simulated to show the proposed controller's effectiveness. Active Steering alone cannot prevent the vehicle from slipping in a turn because of high lateral acceleration due to nonlinear characteristics and tyre saturations. On the contrary, DYC can maintain stability in both linear and nonlinear regions of the vehicle operation. Since the braking action of the DYC affects the longitudinal dynamics of the vehicle, it is not suitable for normal driving situations. Moreover, DYC also causes slowing down of the vehicle which is not desired. Therefore if the both AS and DYC control methods are combined together for producing the right corrective yaw moment, better results can be expected. The combined use of AS and DYC has been explored in recent time for vehicle stability and handling improvement.

2.2 Proposed Method for Classification of DR

In the proposed system the shared steering concept is implemented and so the position of the road id found using the web camera that is being installed in front of the vehicle which is connected to the PC installed in the lab view. Thus by using the lab view the image is processed to check the road characteristics. Stepper motor is used for steering control and LABVIEW is used as software tool instead of MATLAB. The GLCM features are extracted from the segmented region. Using the extracted feature five classifiers SVM, SCG-BPN, GRN, PNN, and RBF are trained and tested for obtaining the best classifier.

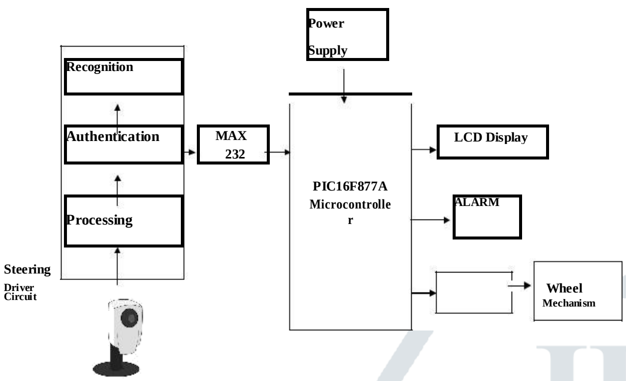


Fig 2: Proposed system block diagram 2.3

Image Pre-processing

The green band is largely used for identification of Roads, cars, Traffic signs, since it gives more information than red and blue bands. The green channel image is filtered by applying a morphological opening as structuring element in order to remove object or obstacle details, since it may contribute to false detection of obstacle. Background homogenization is done using arithmetic mean kernel which smoothens the intensity values uniformly.

2.3 Obstacle Detection

The obstacle are segmented by removing background of the road from the green channel image extracted from the web camera images. The steps for obstacle in the road detection are as follows.

Step1. Road to car segmentation

The road colour and other car are prone to cause bright lesion like appearance during the segmentation of obstacle. Hence it is removed in order to reduce false positive and to improve the accuracy of road to car segmentation. It is based on minimization of the objective function.

Step2. Car segmentation

The segmentation of Car is crucial since its numbers is many with high contrast and is similar to correction. The obstacle is segmentation using a circular mask. An entropy filtering is performed on the pre-processed image clearly segments roads, cars, dividers and road signs.

Fig 3:Traffic sign recognition

3 Feature Extraction

The extraction of features is essential in order to extract the desired information and discard the undesired information. The textural feature utilizes the contents of the GLCM to provide the measure of variation in intensity at the pixel of interest. The features are extracted by pairwise spatial co-occurrences of pixels separated by some angle and distance which are tabulated using the GLCM. The GLCM consist of an NxN matrix, where N is the number of gray levels in the image. The Four GLCM features that are selected as the feature set are correlation, cluster shade, dissimilarity and entropy.

Correlation [16] is the gray level linear dependence between the pixels at a specified position to each other. Cluster shade [17] is a measure of the skewness of the matrix or lack of symmetry. When the value of cluster shade is higher, the image is not symmetric with respect to the texture value. Dissimilarity [18] is a measure that defines the variation of grey level pairs in an image.
It is expected that these two measures behave in the same way for the same texture because they calculate the same parameter with different weights. Contrast will always be slightly higher than the dissimilarity value. Dissimilarity ranges from [0, 1] and obtain maximum when the grey level of the reference and neighbour pixel is at the extremes of the possible grey levels in the texture sample.

Entropy [19] shows the amount of information of the image that is needed for the image compression.

Entropy measures the loss of information in a transmitted image .A completely random distribution would have very high entropy because it represents disorder. Solid tone image would have an entropy value of 0.

4 Classification

Classification helps to identify the classes with similar features. GLCM features such as correlation, cluster shade, dissimilarity, and entropy are extracted. Based on the features the classifier classifies the images as normal, mild, moderate and severe.

The classifier is selected by testing different classifier performances. The classifiers Support Vector Machine (SVM), multilayer network Scaled Conjugate Gradient – Back Propagation Network (SCG-BPN) and Generalized Regression Network (GRN), Probabilistic Neural Network (PNN), Radial Basis Network (RBF) are tested and found SVM classifier is more accurate and have high performance.

4.3 Support Vector Machine

SVMs are efficient learning approaches for training classifiers based on several functions like polynomial functions, radial basis functions, neural networks etc. SVM is a linear classifier that maps the points into the space with separate categories such that they have wider space with a clear gap in between. A hyper-plane is chosen to classify the data. The separating hyper-plane must satisfy the constraints.

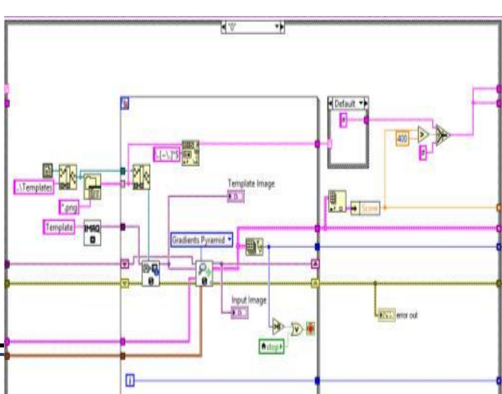
Where

w = the weight vector

b = the bias

E_i=The slack variable

The SVM requires the parameters such as the kernel function and the regularization parameter C. In this work Radial Basis Function (RBF) kernel function is used.



The distance D_i between the training sample and the point prediction is used as a measure of each training sample.

4.4 Generalized Regression Network

It is a radial basis function that is often used functional approximation. The use of this network is especially due to its ability to the underlying function of the data with only few training data available. The probability density function used in GRN is the normal distribution. Each training sample Xj, is used as the mean of a normal distribution

5. Result

In this paper we found the result with image processing though LabVIEW to stop and control the steering and ABS system. And in future we can control the ECU (Engine control unit).

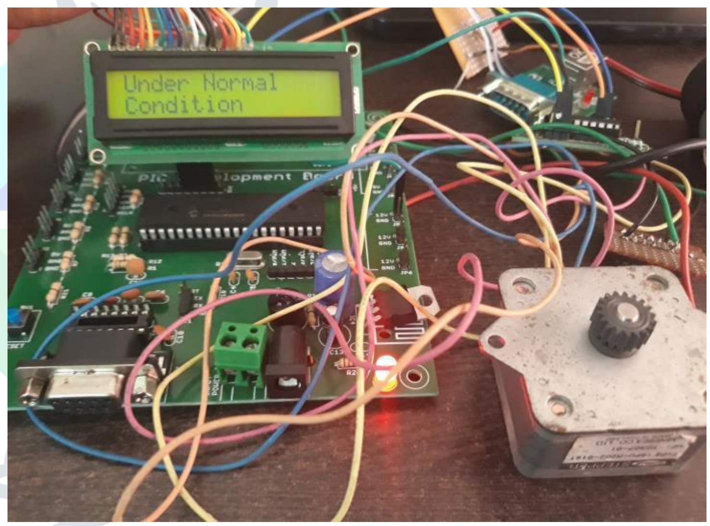


Fig 5: Processing output

Conclusion

The design system provides a flexible, convenient and easy to migrate one place to other place by automated image processing system in the system to prevent accident occurred by sudden uncontrollable situation in the high ways. It save the passengers valuable time. It will be easy and much comfortable to any kind of places. This system make sure that good quality of service.

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