

Research Article

Implementation of Lane Detection in Smart Headlamps

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Abstract

Vehicle intelligent front light system is one of the advanced driver assistance systems. Vision based intelligent front light system is currently the research focus in this field. The purpose of this paper is to present a comprehensive survey of the vehicle front light system development and the latest vision based key technologies and proposals. By analyzing the significant disadvantages of traditional intelligent light systems, some possible improvement proposals and algorithms for lane, vehicle lamp recognition and track are provided. This survey shows that the Matrix-LED system could make the system more flexible and more effective.

Keywords: Lane detection, segmented lamps, Glare

1. Introduction

1.1 Background

ADAS which acts as an assistance for the driver systems such as ACC, CACC, LDW, FCW, BSS, AFS PCW, V2X Start/Stop system have been presented. With the assistance of these new systems, both the inside and outside driving environment would be greatly improved.

Among these various kinds of intelligent technologies, the intelligent front-lighting system which aims to improve the illumination conditions and reduce the accident rate at night is the main topic of my research.

1.2 Need of the Study

Major road accidents occur at night on curve roads and glare occurred from the headlights of front incoming vehicles. Night time driving with conventional headlamps is particularly dangerous: approximately 25% of the driving is done at night but 55% of the driving mishaps occur during this period. AFS helps get better driver's visibility at night time hence achieving improve safety

2. Adaptive beam technology

Adaptive headlight system is active safety system where the headlamp control orientation system control rotates the right and left beam headlights independently to provide better night time visibility.

The AHC (Adaptive Headlamp Controller) is a system which can detect the front vehicles and automatically switch between high beam and low beam according to the front vehicle information. If there is a vehicle in front, the low beam is switched on. And if there is no vehicle in front, the high beam is switched on. In this way, the driver operation fatigue could be avoided, the high beam usage in crowded roads could be increased and the driver safety is improved. Also, there are some other kinds of prediction AFSs which use vision or infrared sensors to detect the obstacles and pedestrians at the crossroads and corners.

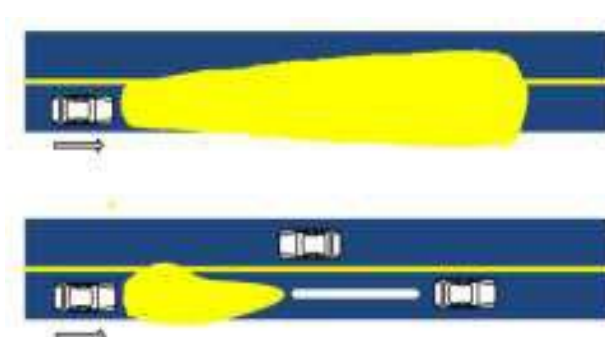


Fig.2 Technology

3. Proposed technology

Unlike conventional headlamps that consist of a single lamp, we propose the use of Matrix LED system consisting of a cluster of LEDs controlled conditionally and automatically.

Along with the segmented lamp we use lane detection technique as an input to trigger the further mechanism.

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Fig.3 Segmented headlamp

Case 1

Consider the case of the vehicle running in the first lane (right most lane), the glare is due to the car coming from the opposite direction.



Fig.4 Lane Detection (right most lane)

First the vehicle detects it is in the first lane using lane detection system. Next it sends a signal to the segmented headlamp to switch off the upper segment right most cluster of LEDs of the right headlamp till it is the first lane.



Fig.5 Upper right cluster turned off



Fig.6 Beam angle cut off

This will reduce the glaring effect and still provide sufficient visibility to the driver to continue driving comfortably.

Case 2

Next consider the case of overtaking a vehicle, the reflection of the vehicle's headlights on the rear view mirror of the car ahead causes glare and discomfort.



Fig.7 Overtake detected

Again, using lane detection system, the cutting of lane is tracked, as shown in fig.8 and the lower segment of the central cluster of LEDs is turned off thus avoiding reflection.



Fig.8 Centre upper cluster switched off

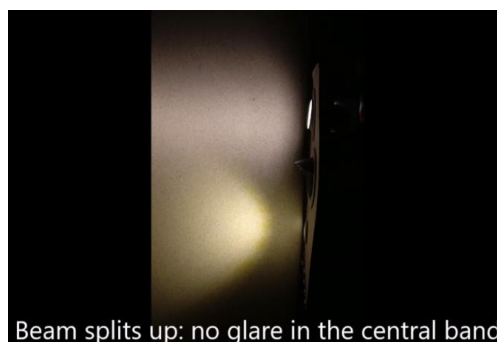


Fig.9 No glare in central band

This continues till the cutting of lane is detected. As soon as the vehicle crosses the lane and is driving normally the lamps go on.

Conclusions

- 1) The intelligent front lighting system provides better safety and illumination control over conventional stationary headlamps

- 2) The proposed technology does not only function during turns and thus is not dependent on movement of steering wheel. Instead it uses more reliable parameter lane detection.
- 3) Also, instead of using a single lamp the proposed technology uses segmented lamp system and thus ensures safe visibility at all times.

References

- Harshal Mohite, Bhushan Mahangade, Maruti Gholase, Sharada Kattgihalimath and Sandip Kumbhar ,Intelligent and Adaptive Headlight with Electronic Controlled Power Steering System (IAEPS) , International Journal of Current Engineering and Technology, E-ISSN 2277 – 4106, P-ISSN 2347 – 5161
- Feng LUO and Fengjian HU, A Comprehensive Survey Of Vision Based Vehicle Intelligent Front Light System,International Journal On Smart Sensing And Intelligent Systems Vol. 7, No. 2, June 2014
- Snehal G. Magar ,Development of Adaptive Front Light Systems, International Journal of Engineering Research & Technology (IJERT),IJERT ISSN: 2278-0181 Vol. 3 Issue 11, November-2014
- Feng LUO and Fengjian HU A comprehensive survey of vision based vehicle intelligent front light system, International Journal On Smart Sensing And Intelligent Systems Vol. 7, No. 2, June 2014