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Machine Vision Based Diagnostic and Smart Front Lighted Automotive Intelligence

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Abstract: **Recently there are number of vehicles are increasing on the road as there is automobile industry is developing over these years. Along with this growth in number of vehicles also there is increment in number of accidents. Actual studies show, that 40% of all accidents occur at night although the part of drives during at night represent only 20% of all drives [5]. Mostly accidents on roads are occurs at night time. Major road accidents occur at night on curve roads and due to glare occurred from the headlights of incoming vehicles. The conventional headlight systems of automobiles do not provide illumination in the proper direction on curve roads and also there is need to operate manually by driver. So there is need of appropriate headlight system for safety drive. This work focuses on the design and working of automatically operated headlight system s "Machine Vision Based Diagnostic and Smart Front Lighted Automotive Intelligence" to safety driving at night for automobiles. The main purpose of this system is to present a cost effective technique to detect headlights of incoming vehicles and according to that adjust the low beam or high beam of related vehicle.**

Keywords: **Conventional headlight system, headlights, low beam and high beam, curved road.**

1. INTRODUCTION

For vehicles headlight system is very necessary thing at night time travel. The same headlights which help for driver for better vision during nighttime driving, it is also responsible for many accidents that are being caused at night time. There are two main reasons for such accidents.

1] Glare of vehicle headlights

2] Improper lighting conditions

Mostly accidents take place at night time due to glare effect on the eyes of driver, due to headlights of incoming vehicles. Temporary blindness of driver can occur when headlights of the vehicles coming in opposite direction falls directly into the eyes of the driver. This result in the driver being blinded for some time and in turn increase the probability of accidents. A vehicle with normal headlights sends the light rays tangentially to the curved road.

There are also instances where the driver fails to switch on the head lamp during night or when the visibility is not sufficient to guarantee safe driving, accidents occur especially in highways. Hence a mechanism to ensure that the head lamps are turned on automatically is required.

Thus, there must be a cost effective mechanism to address the problems of temporary blindness of driver due to glare of headlight and improper visibility at curved road. In this paper, the proposed system is one such solution that helps in preventing an accident by automatically controlling low beam and high beam of headlights and providing proper visibility to drivers by illuminating curves and bent paths.

Here the "Machine Vision Based Diagnostic and Smart Front Lighted Automotive Intelligence" is such solutions that helps in preventing accidents by automatically turn on and turn off high beam and low beam of vehicle according to headlight of incoming vehicle in opposite direction. Also at curved road by automatically rotating the headlights with respect steering of vehicle.

2. DIFFERENCE BETWEEN CONVENTIONAL HEADLIGHT AND AUTOMATICALLY CONTROLLED HEADLIGHT SYSTEM

The existing conventional headlight system does not provide illumination in the right direction and at the precise angle. Due to this constrain, a need to understand an alternative technology solution.

Following Fig: 1 shows illumination of conventional headlight system of vehicle on curved road.

Fig: 1 Illumination of conventional headlight system

This headlamp system is not able to illuminate the curved road fully which result in driver cannot detect objects in the way of the vehicle. Thus conventional headlight system cannot illuminate the curved road in the proper way.

Fig: 2 Illumination of Automatically controlled headlight system

Above Fig.2 shows that illumination of headlight system of car with automatically controlled headlight system. Fig. shows that this headlight system illuminates the actual curved road. Therefore driver can drive with safety at curved road. In this system headlight of car rotates according to position of steering. Therefore at curved road as vehicle take turn then headlights are also rotated with respect to position of steering wheel.

3. RELATED WORK

The headlamps play a very crucial and major role in the driver's visibility and safe driving. But conventional headlights does not work properly also there is need to operate manually. The objective of this paper is to design and build an automatically controlled headlight system for safety drive during night time.

The literature concludes that, "Automatic Headlight Dimmer a Prototype for Vehicles" [1] explained about glare during driving at night is a serious problem for drivers. This creates a temporary blindness for some time called the Troxler effect. This system aims to the working of design and development of a prototype circuit called the automatic headlight dimmer. It gives the driver to use high beam light when required. But it automatically switches the headlight into low beam when it senses there is a vehicle coming from the opposite side.

"Adaptive Headlight System For Accident Prevention" [2] described that Automobiles have headlights that lights up the road in front of the vehicle and fails to provide illumination at bends. Reasons like improper visibility, inability to view objects at the curved road for automobile drivers during late night travel. Therefore the main purpose of this system is to present a cost effective solution to illuminate blind spots during night time driving and during the times when the visibility is reduced significantly to improve visibility in those darkened locations and thereby prevent accidents.

"Nighttime Vehicle Light Detection on a Moving Vehicle using Image Segmentation and Analysis Techniques" [3] described a vehicle detection system for identifying the vehicles by locating their headlights and rear-lights in the nighttime road environment. The proposed system includes two stages for detecting the vehicles in front of the camera-assisted car. At first system separates bright objects on the road, then these bright objects are processed by the proposed knowledge-based connected-component analysis procedure, to identify the vehicles by locating their vehicle lights, and estimate the distance between the car with the camera and the detected incoming vehicles.

"Development of Adaptive Front Light Systems" [4] described that Adaptive front light systems aim at automatically adjusting the headlamps beam of the vehicle to illuminate the road ahead as much as possible without causing any discomfort to other drivers. The proposed system focuses on building a prototype of adaptive front lighting system that improves the night time illumination of the curved roads to the driver. In this proposed system, unlike the traditional AFS which uses steering wheel for the headlamp's horizontal adjustment, we are using a camera as a sensor to adjust the horizontal rotation of the headlamps. Camera is used as image sensor to detect and capture the details of the curved road ahead of the vehicle. As a result a suitable light beam with improved road illumination is obtained for the curved roads. This will lead to better illumination and safety at the curved roads.

"Universal Adaptive Headlight System" [5] explained that mostly accident takes place at night time because of conventional improperly working headlight system. This system gives solution for conventional headlight system. It uses LEDs for headlamps. There are only two beams for conventional headlight system that is low beam and high beam. This proposed work controls the beam of headlights by LEDs. Here beam angle of headlights controlled according to status of steering wheel. For glowing LEDs relay circuit is used. LEDs are used because of their low power consumption. Also this system is easy to implement.

"Development of an Adaptive Headlamp Systems" [6] described that the highest fatal traffic accident rate occurs on curved roads at nighttime. In order to provide enhanced nighttime safety driving, this work aims to design a prototype of steerable headlights by adapting a conventional static headlamp with a very cost effective and reliability. Components which are easily available in the market and suitable for developing a steerable headlight system were tested.

"Study on Visibility and Discomfort Glare of Adaptive Front Lighting System (AFS)" [7] described that increasingly introduced for four-wheeled vehicles. The AFS is designed to improve the visibility for the driver with respect to the driving conditions by controlling the optical axis of headlamps according to status of steering wheel operation also by using a supplementary light source in addition to existing headlamps.

8] "Adaptive Headlight System" [8] discussed about automatically operating the headlamps beam of the vehicle to illuminate the road ahead without causing any discomfort to other drivers. In this paper, the proposed system focuses uses camera which enhances driving safety at night time. When a vehicle is coming near to a curved road, the camera captures the condition of the road ahead. Image recognition and processing is done on the captured road image and details of the road curvature are obtained. Then algorithm processing is done. The processed information is sent to drive the motors to control headlight at required angle.

"Rotatable vehicle headlights" [9] described that this system related with vehicle headlights which rotate the light beam of headlamp with the position of the vehicle's wheels. When a vehicle is travelling on curved road or turning a corner, the light beam of a fixed secured headlight does not illuminate the region over which the vehicle's wheels are travelling thereby restricting the driver's visibility. This invention overcomes that defect.

"Adaptive Front Light Control System for Every Vehicle" [10] described that Major Road mishaps occur at night on account of curve roads and glare caused from the headlights of incoming vehicles. Night time driving with conventional headlamps is particularly unsafe: only 25% of the driving is done at night but 55% of the driving accidents occur during this period. The existing conventional light system does not provide illumination in the right direction and at the precise angle. Due to this constrain, a need to understand an alternative technology solution. Adaptive front lighting systems provides proper visibility to driver at night time driving hence achieving enhance safety.

4. METHODOLOGY

The proposed system flow is illustrated in Figure 1 which shows that, the system first collects inputs, processes them and then accordingly operates headlights of vehicle.

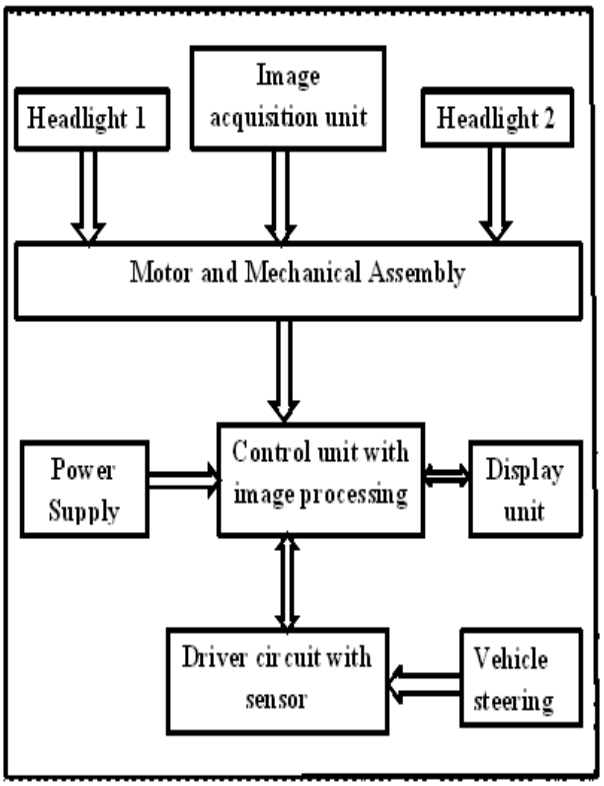

Fig.4.1: Block diagram of Machine Vision Based Diagnostic and Smart Front Lighted Automotive Intelligence.

Headlights:

The headlamps play a very crucial and major role in the driver's visibility and safe driving. For existing headlights there is needed to operate manually by driver to adjust high beam and low beam of headlight system. Also vehicle with normal headlights sends the light rays tangentially to the curve without actual way. Because of these reasons there is possibility of occurring accidents. Based on this Machine Vision Based Diagnostic and Smart Front Lighted Automotive Intelligence adjust the low beam and high beam of headlights also it rotates to headlights according to position of steering.

Image Acquisition unit:

Image acquisition unit the camera mounted in between two headlights. This camera detects the lights form incoming vehicle and captures the image. Then this captured image is sent to image processing unit which processes that image and gives output to control unit that is pic microcontroller. According to that, control unit adjust low beam and high beam of the headlight of vehicle.

Control unit with image processing:

In this proposed work PIC microcontroller PIC16f877a is used as control unit. It controls the headlight system according to the camera and position of steering wheel. Also MATLAB is used for image processing. Image acquisition unit captures images of incoming vehicles and send to the image processing unit. And according to that PIC microcontroller controls the high beam and low beam of headlights.

Sensor:

In this system potentiometer is used as sensor. As we can change the value of resistance by moving its shaft, the potentiometer is connected to steering wheel. Thus resistance of potentiometer changes according to position of steering wheel. Depending on that controller rotates the headlight system.

5. CONCLUSION

- Thus Machine Vision Based Diagnostic and Smart Front Lighted Automotive Intelligence system is an optimal and cost effective solution to prevent frequent accidents in the nights.
- Glare effect during night time driving causes serious problems for drivers. This is caused due to the sudden falling of very bright light rays into eyes of driver. This causes a temporary blindness for driver therefore driver can become blinded for some time it is called the Troxler effect. Eventually this becomes the major reason for night accidents. The driver should actually turn down the bright lights immediately to avoid glare to the other person which is not happening.
- Hence, is the idea for the design and development of automatically switching between high beam and low beam.
- The proposed system provides rotation of the headlamps on either side according to status of steering.
- Machine Vision Based Diagnostic and Smart Front Lighted Automotive Intelligence system increase comfortness, enhance Safety and increase reliability.

Future Discussion:

This project can be continued for further work where more things can be added such as automatically controlling speed of wiper system depending on climate so that person who is driving car can be safety with his car.

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