

Research Article

## Intelligent and Adaptive Headlight with Electronic Controlled Power Steering System (IAEPS)

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### Abstract

According to traffic accident data, the maximum of server road accidents occurs at night vision. Therefore of great importance to use available technology to contribute to road safety by increase the visual conditions provided by vehicle headlights. In order to provide improved night time safety measures, this work aims to design & build a prototype of Intelligent and Adaptive Headlight with Electric Power Steering System. This prototype model is focus to achieve active and passive safety system. In this an intelligent and adaptive system is active safety system where as EPS is passive system. This idea gives more advantages for automobile. It gives the advantages such as low level of steering torque during static steering, increase fuel efficiency or economy, low weight of vehicle because of using EPS system, flexibility in steering system and more space for driver and front passenger.

**Keywords:** Adaptive headlight system, Electronic controlled power steering system, Intelligent headlight system, Microcontroller circuits, Sensors.

### Introduction

The rate of accident are much and more at the night drive then at the day light, for avoiding this accident this concept are very useful for automobile. The reason has to why focus on the subject of producing the safety car is related to the statics the expose the serious consequences of accident in 2014 out of 6,98,451 accident 4,882 people dead and remaining people has injured with a corresponding financial loss in India . The concept of moving headlamps is not a new one. An innovation in lighting was to vertically tilt the beam high to low and low to high beams switching dating back to 1917. For long beam adjustment able to compensate for occupancy of rear seat or car available at loading became which control through an internal typically wheeled adjustment. Adaptive headlight system moves the headlamp by turning the vehicle through the steering. This places light into the turning radius visibility at the cornering improved. There was Potentiometer used on steering to measure angle and speed of steering. Based on the information swirl headlight can match the light distribution steering wheel angle so that upcoming turns driver can easily see and its increase help to relief trees on mind of driver. Now a days world are going on the

mechatronics, by using the mechatronics system Mechanical linkage are reduced. The main objective of using mechatronic system is reduced weight of vehicle by reducing mechanical linkage. In this paper introduce Electronic control power steering (EPS) which totally based on the Mechatronic system by using Microcontroller, Relay, Sensor and Motor. Electric power steering system have attracted much attention for these advantages with respective improved fuel economy, less weight of vehicle, flexibility of steering arrangement and have been widely adopted automotive power steering equipment in recent year. The EPS control system reduces steering torque during static steering (while vehicle at the rest position) that means of further improving EPS control performance.

### Problem Definition

In this paper focus on the basically there system which is related to safety for driver at the time of driving in the night drive. The rate of accident are much and more at the night vision then at the day light, for avoiding this accident this three concept are very useful.

1. Intelligent headlight system
2. Adaptive headlight system
3. Electric control power steering system

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The maximum accidents are happened at serve road at the night. It is therefore of use grate importance to us available technology to contribute to road safety to improving the visual condition accident by vehicle headlight system is the active safety and the steering control system is the passive safety system. In the Hilly and Clumpy areas accidents are more in the time because the static headlamp just provided certain laminating fields for drivers, also driver is insufficient to service / show for curved roads and intersection. Accident statics demonstrate that driving at night time, considerably more dangerous that it's daytime. In the night tie also having Human problems, the Human problems are lower performance of the human visual system under poor ambient lighting condition, color and depth perception on the road, the fear of dazzling drivers of leading or overtaking of vehicle. The static headlight having a problem of drivers because he can't see full road corners of the road. At the time of heavy vehicles cannot dippers the headlight so that opposite drivers can't see the road so that accidents are happened. Over 80% of all road traffic accident occurs in the darkness and bad weather a compelling reason to put effort into developing the next generation of intelligent lighting system with multi-functional swirling headlamps. The reason as to why researches focus on the subject of producing safer cars is related to the static that expose the serious consequence of accident. In 2014, out of 698,451 accidents, and 4,882 people are died and remaining peoples were injured a corresponding financial loss.

### Intelligent Headlight

The movement of headlight with the movement of steering wheel in the corners or on the road, giving the drivers a better look of road at night time. Light sensor, which sense intensity of light and turn on headlight whenever intensity of light fall below certain value and display massage at Night mode. Automatic Light dimmer, which consist of two LDR based light intensity sensor. These two sensors are placed 12 apart in front of vehicle in vertical position. If upper sensor senses more intensity of light, it activities light in dimmer mode.

### Adaptive Headlight

Adaptive headlight system is active safety system where the headlamp control orientation system control rotates the right and left beam headlights independently and keeps the beam as parallel U the curved path as possible as to provide better night time visibility.

### EPS

Electronic power steering (EPS) system is a very important component for improving automotive handling and stability. An EPS system includes mechanical subsystem and electronic and control

subsystem, and it has to work in the full vehicle mechanical system. In the development process of the EPS system, different subsystems have to be developed in parallel so as to reduce time and cost of system development. Cooperation between engineers for developing different subsystems is also needed.

### Methodology

The maximum accidents are happened at serve road at the night. It is therefore of use grate importance to us available technology to contribute to road safety to improving the visual condition accident by vehicle headlight system is the active safety and the steering control system is the passive safety system.

1. Intelligent headlight system
2. Adaptive headlight system
3. Electronics control power steering system
4. Sensor
5. Microcontroller

#### 1. Intelligent Headlight system

The movement of headlight with the movement of steering wheel in the corners or on the road, giving the drivers a better look of road at night time. Light sensor, which sense intensity of light and turn on headlight whenever intensity of light fall below certain value and display massage at Night mode. Automatic Light dimmer, which consist of two LDR based light intensity sensor. These two sensors are placed 12 apart in front of vehicle in vertical position. If upper sensor senses more intensity of light, it activities light in dimmer mode. In intelligent headlight system upper and dipper included the use dipper is very important during night to avoid any accident. Several studies on visibility measure of realistic road way task indicate that in road lighting condition targets located on the road have mainly lower luminance than the background thus, increasing the luminance of the background against which a target viewed increase the target contrast and chances of the target to be detected. Ti has been shown that under fixed road lighting condition, visual performance improves with increase in road surface luminance and with decrease luminance. When the impact of dipped headlights is added to the effects to the road r. lighting, both the road surface and the target are illuminated. Automatic light dimmer, which consist of two LDR based light intensity sensor. This module helps to shows the driver at high speed vehicle on road where there is no any divide- rant vehicle are coming from opposite side. The module helps to receive light intensity of light coming opposite side and turn on dipper. The intelligent headlight system keeps the headlight high beam if there is no vehicle from opposite direction. At the time of crossing the vehicle headlight automatically dipped when two vehicles are dipped at distance approximately 130 meter by using momentary dip with auto dipper. When distance between two is

reduced to about 90 meters still low beam are continuous than vehicles shift to high beam which continuous still the two vehicles are 40 meters apart. Now the vehicle fitted with auto dipper automatically shift low beam and continuous in the low beam till the two vehicle cross each other.

2. Adaptive headlight system

According accident data more accident are occur at the night time so that it is a great importance to use available technology to contribute to road safety by improving the visual condition provided by vehicle headlight. It is an active system. The aim of development in active safety is to reduce the reaction time of the driver by improving visibility and achieve a significant increase in road safety and driving comfort. Adaptive headlight system is an a active safety system where the headlamp control orientation system control rotates the right and left beam headlights independently and keeps the beam as parallel to the curved path as possible as to provide better night time visibility.

3. Electronics Power Steering System

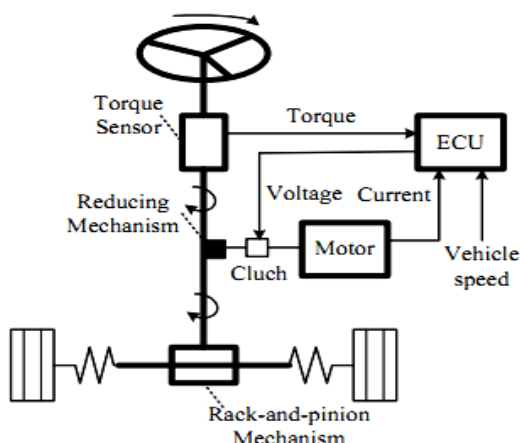


Fig 3.1.1 Electronics Power Steering System

Compared with the traditional hydraulic steering system (HPS), Electric Power Steering (EPS) system adopts motor to be offer the driver assistance directly and has the advantages of economy, handiness, easy adjustment, less noise and waste ,oil pollution and so on the composition and working principle of EPS system . EPS system is mainly composed of speed sensors, steering wheel rotation sensors (including torque sensor and speed sensor), electronic control unit (ECU), power drive circuit, clutch, DC motor and so on. ECU decides the rotational direction and suitable assistant torque of motor according to the sensors output signals, sending control signals to motor, clutch and then controlling motor’s rotation through power drive circuit. The output of motor from the decelerating gearbox drives rack-and-pinion

mechanism to produce the corresponding steering power.

A-Modification of Headlight

A potentiometer was mounted on the steering shaft giving variable inputs. As the steering shaft turns, it turns the potentiometer. The potentiometer then gives an analog input into the controller unit. The controller unit processes the input and gives the exact output current to turn the servomotor an initially programmed. To move the headlight 15 degrees from left to right proportionally with car steering requires a motor and microcontroller. For example, as the car turns right, the headlight will turn right also, therefore illuminating more on right hand side of the road. The projector light was removed and modified so that it can be attached to the servomotor. The projector light is mounted on a bended aluminum strip. Next, the mounting for the servomotor was done, by attaching it to the bended aluminum strip, so that it can be attached to the headlight casing. The aluminum strip and projector light are then mounted back in the casing. The position of the mounting is adjusted so that the projector light can rotate at least 10 degrees left to right, per the specification.

B-Sensor Block

The position of the headlights is dependent on the direction of the vehicle so the input to the headlight system is attached to the vehicle’s steering shaft. A simple geared mechanism is attached to a low-power type potentiometer that can then feed directly into the microcontroller. As the steering shaft rotates(taking corners), it will turn the axle of the potentiometer and therefore vary the voltage input. The voltage input that varies from 0-5 volts is converted into digital input via the A/D channel of the PIC 16F877A microcontroller. For example, If the headlight is set at the center with an initial voltage of 2.5V,if the voltage increases as the potentiometer turns, the PIC reads this voltage increment and will turn the motor as programmed.

C-Microcontroller

A Programmable Intelligent Computer (PIC) microchip was used to control the motor. The PIC selected is the PIC16F877A which is an 8 bit microcontroller with 8KB flash program memory and USART. The PIC16F877A was selected because of its availability, low price, reliability, and its use of C language for its programming. The selected PIC also required minimal additional components in order to operate, further controlling system costs. By using above active and passive safety system we can avoid the accidents which appear at night vision.

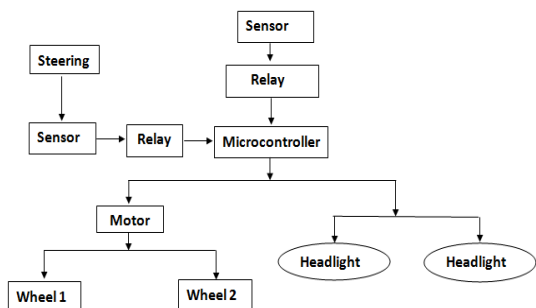
**Case Study**

**Function**

In the Adaptive headlight system the headlight are movable according to the movement of the steering wheel. The second one is the Intelligent headlight system in that system the use of Light sensor the light of the vehicle up or down automatically. In steering system , the rotary motion of the steering wheel is converted in to the angular turning of the front wheels. Steering is done by moving the axes of rotation of the wheels with respect to the chassis frame.

**Working**

This module of project is very much useful for driver’s safety during especially in the night on highway where there are no dividers and road is having turn as the driver rotates the steering the car used to take a turn but the focus of headlight goes put of intended road section. Through this module if the driver will rotate the steering then the headlight will also rotate and focuses the intended section of the road and hence this can prevent accident. The steering movement is sensed and sent to the PIC16F887 which converts the analog signal into digital through the internal ADC and process the data. After processing data is send to the motor drive throughout port. Motor drive will rotate the head light according to the steering movement. The rotation of steering will lead to the change in the output voltage across potentiometer that is from 0V to 5V this output voltage will be taken by PIC microcontroller and as per the output of potentiometer across 2.5V either in positive(+) or in negative (-) will lead to the movement of headlight either left or in right by using a motor. Also light sensor, which sense intensity of light and turn on head light whenever intensity of light fall below certain value and display message Night mode.



**Fig 3.1.2** Block diagram of IAEPS Model

**Advantage**

- To provide smooth and safety ride in curved road especially in mountain road.
- To provide mind free ride for the motorist.
- To provide the nation with an accident free roads.
- Low cost automaton project.
- The headlight aligns in two direction ( Left and Right )

**Conclusion**

In the above dissertation work we found the idea about intelligent and adaptive headlight with EPS system. The aim is to improve the visibility for the drivers thereby achieving avoid the accident in the night vision more efficiently. This paper is really useful to carry researcher work point of view.

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