

# ADAPTIVE HEADLIGHT SYSTEM

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## ABSTRACT

The most important part of this project is Front wheel of steering system with moveable headlights with latest technology. The most suitable steering arrangement is to turn the front wheels using a hand-operated steering wheel which is positioned in front of the driver, via the steering column, which may contain universal joints to accept it to deviate somewhat from a straight line. This idea gives more advantages for automobile. It gives the advantages just likes low level of steering torque during static steering, more 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. Special safety features have been inbuilt into cars for years, some for the safety of car's driver only, and some for the safety of others. One of the choices available is Design and fabrication of steering controlled head light system. Car safety is to prevent of automobile accidents or the minimization of harmful effects of accidents, in particular as pertaining to human life and health. Still, more specially, this device relates to a headlight arrangement operably connected to the steering and front wheel assembly of and automobile operably to maintain headlight members and the front wheels pointed in the same direction at all times.

**Keywords:** Moveable headlight, Car safety, Conventional steering arrangement

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## I. INTRODUCTION

Car safety is the avoidance of automobile accidents or the minimization of harmful effects of accidents, in particular as pertaining to human life and health. Special safety features have been inbuilt into cars for years, some for the safety of car's occupants only, and some of the safety of others. One of the choices available is Design and fabrication of steering controlled head light system. This system relates to a headlight arrangement for vehicles, and, more particularly, to a head light arrangement operably connected to the steering mechanism of the vehicle for illuminating the proposed path of travel including support brackets operable to support head light members there on connectable to a frame portion of the vehicle, linkage means interconnecting the brackets for conjoint movement thereof, and means interconnection between connectors and one of the brackets of the vehicle whereupon the brackets and headlight members are moved in relation to the direction of vehicle travel. Still, more specifically, this device relates to a headlight arrangement operably connected to the steering

and front wheel assembly of an automobile operable to maintain headlight members and front wheels pointed in the same direction at all times.

## II. PROBLEM STATEMENT

A four wheeler usually find difficulty to drive especially at sharp turn at night because of insufficient light. This system helps them to change the focus of headlight as the steering move on either direction. Adaptive headlights react to the steering system of the car and automatically adjust to illuminate the road wheel. Turn the car left, the headlights angles moves to the left. Instead of moving the headlights, reflectors are fitted on the inside on either side of the headlamp casing system. These reflectors are moved in the same direction as the movement of the vehicle. The power required to move the reflectors is transmitted using hydraulic linkages.

## III. OBJECTIVES

The main aim to change the head light direction on sharp turning as possible as. The vehicle should get

illumination front view that could help to driver taking turn on hill areas by using mechanical system like bevel gear system and rack and pinion arrangements and also to make the nation with an accident free.

**IV. WORKING METHODOLOGY**

1. Prepare Research Paper and perform a literature review to provide background information of Headlight Mechanism procedures and to review the results of previous studies
2. Collection of Data
3. Numerical Calculation of Arrangement
4. Design the Model Of Adaptive Headlight on software
5. Testing and Analysis of Model design
6. Develop Prototype
7. Testing and on prototype
8. Obtain Final Result
9. Conclusion

**V. CONSTRUCTION**

The main components used in this project are:

**1) Spur Gears:** Spur gears are the simplest, and probably most common, type of gear. Their general form is a cylinder or disk. The teeth project radially outward, and with these "straight-cut gears", the leading edges of the teeth are aligned parallel to the axis of rotation. These gears can only mesh accurately if they are fitted to parallel axis.

**2) Rack and pinion steering system:** The rack-and-pinion steering box has a pinion, connected to the steering column. This pinion runs in mesh with a rack which is connected to the steering tie rods. The rack-and-pinion steering gear box has a pinion, connected to the steering column. This pinion runs with a rack which is connected to the steering tie rods. This gives a direct operation.

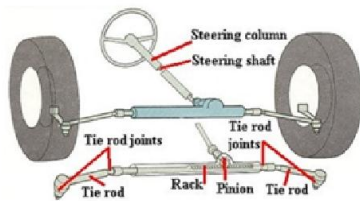


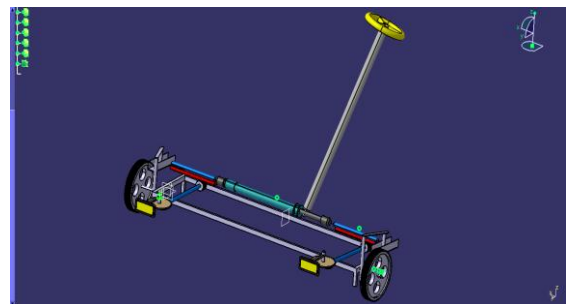
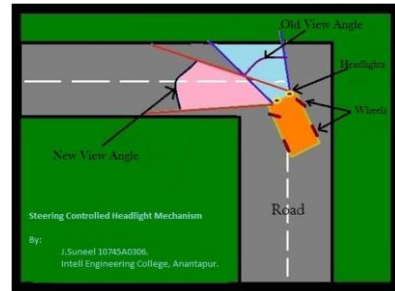
Fig. Steering gear box

**Arrangement Of Head Light Mechanism:**

The head lights are mounted on a bar which one end is fixed to a board and the other end is connected to a moving bar which is fixed to a rack and pinion mechanism. A horizontal bar made of steel is fixed in between the two frames and a linkage mechanism is connected to the extension of linkages of a rack and pinion mechanism. This mechanism moves in accordance to the circular motion of steering. The two

attachments are linked with each other through a rectangular bar having two slots at both the end sides.

**VI. FIGURE & EQUATIONS**



**Calculations**

Steering Angle Calculations:

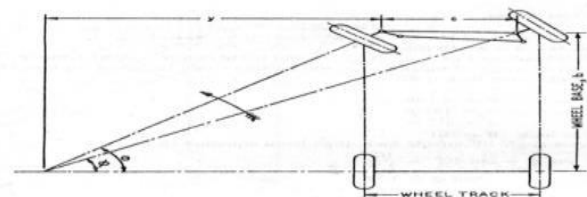


Fig: Correct steering angle

$$\text{Cot } \phi = (y+c)/b$$

$$\text{Cot } \theta = (c/b)$$

$$\text{Cot } \phi - \text{Cot } \theta = y/b$$

Where,

- b = wheel base
- y = pivot centre y is represented in the figure
- c = wheel track

Data obtained by measuring the experimental set up

- b = 3.7m
- c = 1.2m
- y = 2.2m

By calculating using above values ,  
 $\theta = 58.92^\circ$

**Ackermann Steering Mechanism Calculations,**

$$\text{Sin } (\alpha+\theta) = (y+x) / r$$

Where,

- l = length of the track rod
- r = length of links
- x is represented in the figure
- $\alpha = 1/2 * \text{angle between links RA and SB with centre of vehicle as origin}$

## REFERENCES

Following is the data obtained by measuring the experimental set up,

$$r = 0.16 \text{ m}$$

$$l = 1.1 \text{ m}$$

$$c = 1.3 \text{ m}$$

$$\sin(\alpha) = (c - l)/2r$$

By substituting the values we get,

$$\alpha = 38.68^\circ$$

$$\theta = 58.92^\circ$$

$$\sin(\alpha + \theta) + \sin(\alpha - \phi) = 2\sin(\alpha) \rightarrow (1)$$

$$\cot(\phi) - \cot(\theta) = c/b \rightarrow (2)$$

Substituting  $c = 1.3$  in equation (2)

We get,

$$b = 0.77 \text{ m}$$

And from equation (1)

we get,

$$\phi = 23.73^\circ$$

## VII. ADVANTAGES AND APPLICATION

1. Useful for heavy vehicles in hill areas, where hair-pin bends are more.
2. Safe riding.
3. Provide the nation with accident free roads.
4. Simple in structure.
5. Mind free driving.
6. Manual power required is less.
7. Easy to operate.
8. It requires simple maintenance cares.
9. Repairing is easy.
10. Replacing part is easy.
11. No need of heavy lubrication.

## DISADVANTAGES

1. Not mandatory for straight roads.

## APPLICATION

1. Can be used in all heavy vehicles such as bus, truck, which ride maximum in ghat road.
2. Specially designed for installing in buses riding in ghat road.
3. Can be used in tempo and vans.
4. This mechanism can also installed in all types of commercial vehicles such as: Maruthi, Ambassador, Fiat, Mahindra, Tata, etc.,

## VIII. CONCLUSION

An effective steering controlled headlight mechanism was designed, based on Ackermann Steering mechanism and a live model was developed. Cost analysis was also done and a new mechanism at nominal cost was presented.

Hence the steering angle was calculated & found to be

$$\phi = 23.73^\circ$$

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