International Journal For Technological Research In Engineering
Volume 5, Issue 4, December-2017 *ISSN (Online): 2347 - 4718*

ANALYSIS OF MOVABLE HEADLIGHT IN FOUR WHEEL DRIVE

Ankur H. Vyas
Assistant Professor, Mechanical Engineering department, KJ Institute Of Engineering and Technology, Savli, Gujarat, India-391770

ABSTRACT: In today's era speed with safety is the main concern. The highest report for accidents occurs due to poor vision during the night-time and on curve roads on hilly regions as well as the late detection of objects using the static headlamps plays key role in major cases of accidents. This facts highlights the improvement in light forwarding system for better visually. In order to solve this problem and provide ease in travelling our project focuses on design and working of movable headlight system for auto motives to enhance the safety at night-time by making the objects visible in dark areas which will reduce the number of accidents.

I. INTRODUCTION

Aside from functionality, safety while driving is our main concern in this project. The conventional headlamps provides certain illuminating fields while driving in the nighttime and it is insufficient for the drivers to serve for curved roads, intersections and bending roads. Over 75 percent of road accidents in the night is occur due to poor visibility and bad weather. Our main concern in this project is to improve the visibility for the drivers, thereby significance improve in road safety and enhanced driving comfort. In movable headlights, swivel the headlamps in prior the vehicle's turning. This highlights the turning radius, sharp turns, obstacles etc hence visibility for driver is dramatically increased. Combined with this vehicles on road data also simultaneously collected i.e. wheel speed, yaw (angle of vehicle rotation along with vertical axis reference to the path) and according to that headlamps match the distribution of lights so curved path receives maximum illustration. Apart from conventional headlight it is most useful and reliable system in automobile as it doesn't have manual control system. It does not required to adjust the beam every time as it will adjust itself for given conditions. Also it gives self-protection as some people forget to adjust the beam while driving in manual control system. In this MHS, the headlamps will automatically rotate towards the right/left accordance to the movement of the steering position right/left. This also contains mechanical part, programming part, electronic and electrical part.

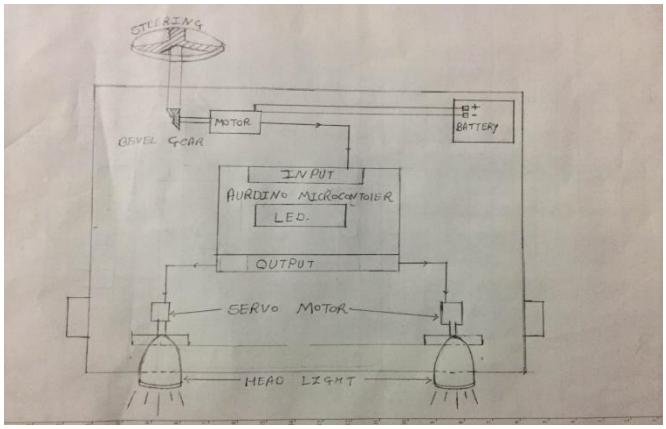
II. OBJECTIVE

- Automatic headlight system for automobile
- High safety
- Reduce driver stress
- Enhanced driving
- Better visibility
- Reduce accident rates
- Low cost and reliable product

III. BRIEF LITERATURE REVIEW AND PRIOR ART SEARCH (PAS)

We have make use of internet to study about various components related to the movable headlights, how they works, and their alternatives.Also we have studied various mechanismsabout rotation of headlamps and electing optimum of that. For better understanding, we have studied several patents on movable headlights among them one is illustrated below.

Plan Of Their Work:



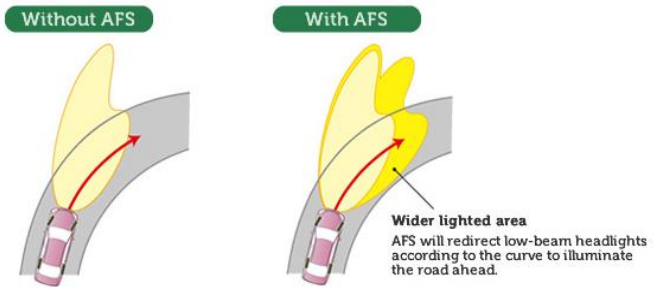
Materials And Tools Required:
Tools such as motor , led, battery ,power supply, capacitor, headlamps, resistors, pcbAurdino UNO (controller), car steering, steering road, bevel gears, motor, servo motor, actuators etc are required to rotate the headlights according to the position of steering wheels.

Implimentation:
We have studied several patents and also with the help of internet we understand different methods for rotating headlights. Some of the methods are listed below:
Hydraulics
Pneumatics
Electrically controlled
Mechanically
Manual operating

Actual Implementation
In above mentioned method are varies on their mechanisms and on their efficiencies of working.
1) In hydraulics the major problem is leakage of fluids and maintenance also the running cost of fluid is more
2) In pneumatics the working cost and space for compressor is more. Although the working fluid is free, the noise and vibrations are major issue.

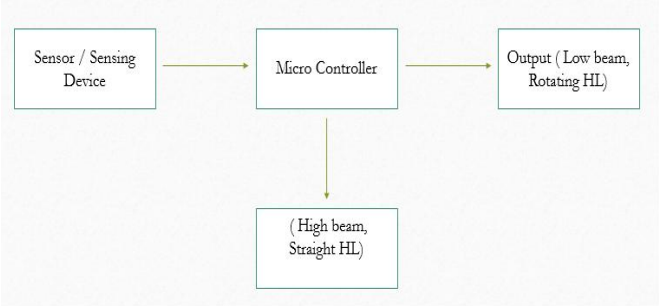
3) In electrically controlled programming is complicated and initial cost is more as the steering positioning sensor is very costly.
4) In mechanically controlled headlights the lights give response for very small movements of the steering while car changing the lane on highways, this deviates driver's concentration and also the life of mechanical component is less it is less preferred.
5) Manual operating system is tedious and time consuming. To overcome this our project is based on combined of mechanical, electrical and of control engineering for optimum results.

Movable Headlight System:
As we are concern with the automatic rotations of headlamps, we are connecting headlamps to the steering via micro controller.Movable headlights are an active safety feature designed to make driving at night or in low-light conditions safer by increases visibility around curves and over hills. When driving around a bend in the road, conventional headlights continue to shine straight ahead, illuminating the side of the road and leaving the road ahead of you in the dark. Adaptive headlights, on the other hand, turn their beams in accordance to your steering input so that the vehicle's actual path is lit up.



Similarly, when a vehicle with standard headlights crests a hill, the headlight beams temporarily point upwards towards the sky. This makes it difficult for drivers to see the road ahead and for oncoming motorists to see the driver approaching. In contrast, adaptive headlights use a self-leveling system that points the light beam up or down, in accordance to the position of the vehicle.
The swivel of headlamps is restricted to 30 degree as per the data collected from the giant company in automobile 'AUDI'. The micro controller and headlamps are connected to the power sources to perform different tasks. The major units of project are given below.

Block Diagram:



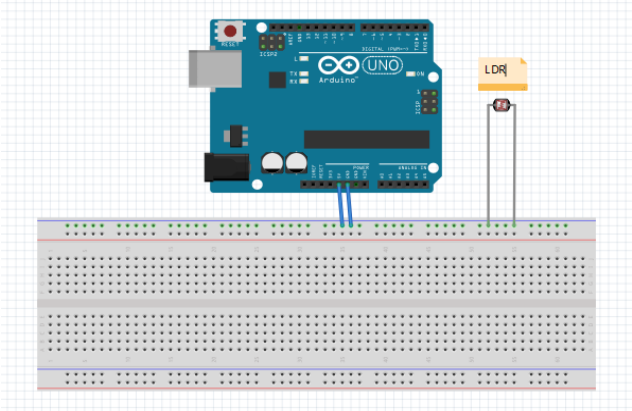
As shown in block diagram our project is mainly consisting of 3 units:

- Sensing device
- Micro-controller
- Output device

1) Sensing device:
In our project bevel gears as the sensing device are used. Bevel gears takes input of steering shaft rotation. This rotates the shaft of motor connected to the bevel gears. This output is observed by micro controller.
2) Micro controller:
The main function of micro controller is to take input from sensing device and activates the output devices which is servo motor. It is programmed as steering rotates 90 degree the headlight will rotate 30 degree.
Arduino UNO, we are using as a micro controller.

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.The output coming from the motor is read by controller. As 90 degree of steering rotation is observed by bevel gear to the micro controller and gets stimulated. Micro controller activates the output devices for given signals as per programmed.

3) Output devices:
Output devices consist of servo motor and headlamps. The output signal coming from micro controller will actuate the servo motor to according to the steering rotation. This servo motor is connected to the headlamps facing the road causing the rotation of headlamps. This swiveling motion is restricted to the 30 degree which is referred from the AUDI Company (link is given in the references).



Programming And Analysis:
Program And Softwarefirst we have to programming for attaching Servo, LED and LDR. The software used to compile the program is ARDUINO SOFTWARE.

```
//This is my Final Project, Adaptive Headlight System
#include <Servo.h>
int LDR=0;
intLDRValue=0;
intlight_sensivity=900;
Servo servo;
intpos = 0;
//This is my Final Project, Adaptive Headlight System
#include <Servo.h>
int LDR=0;
intLDRValue=0;
intlight_sensivity=900;
Servo servo;
intpos = 0;
void setup()
{
Serial.begin(9600);
pinMode(8,OUTPUT);
pinMode(10,OUTPUT);
servo.attach (2);
servo. write (0);
}
void loop()
{LDRValue=analogRead(LDR);
Serial.println(LDRValue);
delay(50);
if (LDRValue>light_sensivity)
{
digitalWrite(8,HIGH);
delay(200);
digitalWrite(8,LOW);
digitalWrite(8,HIGH);
digitalWrite(10,LOW);
servo.write (10);
}
else
{
digitalWrite(8,LOW);
digitalWrite(10,HIGH);
servo.write (0);
}
}
void setup()
{
Serial.begin(9600);
pinMode(8,OUTPUT);
pinMode(10,OUTPUT);
servo.attach (2);
servo. write (0);
}
void loop()
{LDRValue=analogRead(LDR);
Serial.println(LDRValue);
delay(50);
if (LDRValue>light_sensivity)
{
digitalWrite(8,HIGH);
delay(200);
digitalWrite(8,LOW);
digitalWrite(8,HIGH);
digitalWrite(10,LOW);
servo.write (10);
}
else
{
digitalWrite(8,LOW);
digitalWrite(10,HIGH);
servo.write (0);
}
}
```

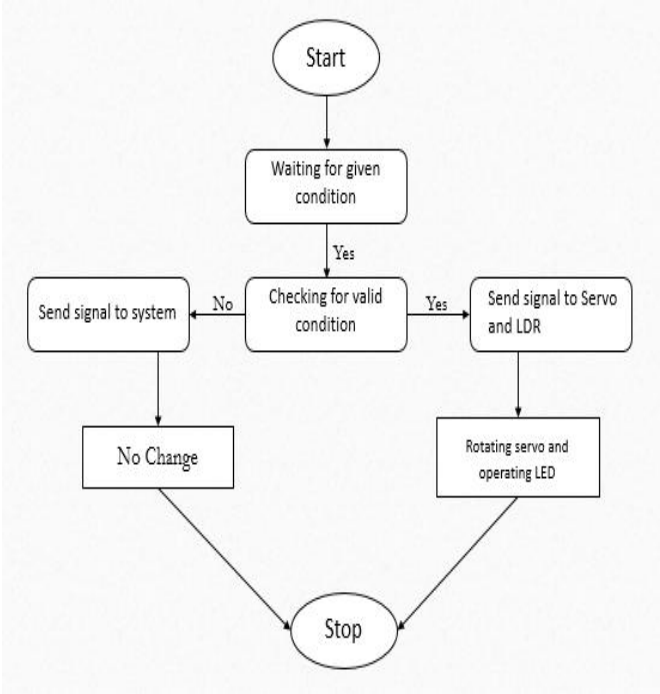
IV. RESULTS

As the program compiling is successful it will work as expected. In this project , as the vehicle take turn left or right, after 90 degree of steering rotation according to that headlights will rotate left or right up to 30degree. As steering back to its original position the headlights will come to the ordinary straight position very fast. And the motto of the project is fulfilled.

Summary:
Standard headlights shine straight ahead, no matter in which direction the car is moving. When going through curves, they illuminate the side of the road more than the road itself. Movable headlights adjust according to the steering, speed and elevation of the car and automatically adjust to illuminate the road. When the car turns right, the headlights turns to the right. Turn the car left, the headlights angle to the left. This is important not only for the driver of the car with a movable headlights, but for other drivers on the road as well. The glare of oncoming headlights can cause serious visibility problems. Since movable headlights are directed at the road, the incidence of glare is reduced.
A car with movable headlights uses electronic sensors to detect the speed of the car ,and the yaw of the car. While the bevel gears detect how far the driver has turned the steering.

Yaw is the rotation of the car around the vertical axis - when a car is spinning, for example, its yaw is changing. The sensors direct small electric motors built into the headlight casing to turn the headlights.

System Flow Chart:



Advantages:

- Useful for heavy vehicles in hill areas, where hair - pin bends are more.
- Enhanced driving comfort
- Accident free roads
- Improved visibility
- Stress free driving
- More area on the road will be covered
- Glare free driving

Unique Features:

1. Sensing device cost is low(as bevel gear is cheaper compared to electronic sensors)
2. Precise and accurate
3. Maintenance cost is low
4. Swivel of headlamps are controlled by servo motors
5. Compact in size
6. Rotation of headlamps are rapid in action as70km/h
7. Simple in design and easy to use
8. Overall cost is low

Conclusion

Before undertook this project, knowledge about headlights was limited. After doing an extensive research for this project now have a wider knowledge of this field in automotive technology, learnt useful information about different types of headlights. I have searched in the library for relevant books and the internet for additional information. During the build of an experimental model of adaptive headlights I have improved my skills and technical problem solving ability .Carrying out test with the project vehicle has proved that this concept works and although such lights are not widely used even nowadays, it helps to reduce black spots while cornering and therefore reduces the risk of accidents, by auto low beam for front coming vehicle and helping to notice persons or objects hidden in a bend earlier in advance. I'm looking forward to see more road vehicles equipped with movable headlights in serial production.

Testing

Testing Plan

Testing Planning involves how to plan testing before we are going to start the actual testing. First step of testing is to test each and every component that we bought and are going to use for the final manufacturing.

Then in second step we did testing over our final product, based on various techniques so that we can make our product error free.

For this we have used techniques that were feasible in our economic and technical scopes.

Testing strategy

Testing begins "in the small" and progresses "to the large". Initially individual components are tested. After the individual components have been tested and added to the system, integration testing takes place. Once the full product is completed, system testing is performed. Testing is different from debugging, once we have made the testing we have to analyze the results and make changes accordingly.

The initial testing was very basic, the components like motor and shafts were tested in their basic forms just to be assured about their working. The important testing took place after the final.

Limitations

- As the projects combines the use of mechanical elements such as gears, on the longer run the performance of the system may vary due to the wearing of such elements.
- The use of the project is limited to light and heavy motor vehicles only and hence cannot be used in

two wheelers

- The design of the arrangement varies from one vehicle to another according to the space available apart from the engine space allotted

REFERENCES

[1] Angle to be swivel. http://auto.howstuffworks.com/adaptive-headlight.htm
[2] Arduino.cc,. 'Arduino - Servo'.
[3] Bmw-motorrad.com,. 'BMW Motored : Safety Concept : Lighting'
[4] Electrical4u.com,. 'Light Dependent Resistor | LDR & Working Principle Of LDR |
[5] Element14. com,. 'Arduino | Projects, Tutorials, Videos And More | Element14'.
[6] Forum.arduino.cc,. 'Arduino Forum - Index'.
[7] Fritzing.org,. 'Fritzing'.
[8] GmbH, Interone. 'BMW Technology Guide: Adaptive Headlights'. Bmw.com.
[9] Grabianowski, Ed. 'How Adaptive Headlights Work - Howstuffworks'.
[10] HowStuffWorks11. Jameco.com,. 'How Servo Motors Work'.
[11] Learn.adafruit.com,. 'Overview | Arduino Lesson 14. Servo Motors | Ada fruit
[12] Learning System'14. My.teslamotors.com,. 'Based On Current Technology, Is Xenon Or LED Headlights
[13] Schindle , Morton, and Peter Fleischmann. Alexander An d The Car With A
[14] Missing Headlight. New York: Viking Press, 1967. Print.
[15] Scribd.com,. 'Steering Controlled Headlights Project Report'.
[16] Storr, Wayne. 'Light Sensor Including Photocell And LDR Sensor'. Basic Electronics Tutorials.
[17] Technologystudent.com,. 'Light Dependent Resistors'.

