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Fabrication of Automatic Head Lamp Alignment System with Fog Detection in Four-Wheeler

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ABSTRACT: The highest fatal traffic accident rate occurs on curved roads at night-time. In most cases, the late recognition of objects in the traffic zone plays a key role. These facts point to the importance of the role of automobile forward-lighting systems. In order to provide enhanced night-time safety measures, this work aims to design and build a prototype of steerable headlights by adapting a conventional static headlamp with a very close eye on cost and reliability.

Components that are easily available in the market and suitable for developing a steerable headlight system were tested. Different kinds of tests were done on critical parts of the system in order to determine its accuracy, its response time, and the system impact. Finally, the results acquired from these various tests will be discussed. Any findings and changes that should be made are discussed and may be useful for future development.

A majority of serial collision accidents happens when visibility is low due to fog. The risk of these accidents can be reduced considerably with a system containing visibility sensors and variable speed-limit signs.

KEYWORDS: AUTOMATIC HEADLAMP ALIGNMENT, MOISTURE SENSOR, ARDUINO, SERVO MOTOR, HEADLAMP INTENSITY.

I. INTRODUCTION

The static headlamp just provides certain illuminating fields for drivers in the night-time and is insufficient to serve for curved roads and intersection, Advanced Front-lighting System (AFS), has been proposed by many researchers and is catching increasing interest. Over 80 percent of all road traffic accidents occur in darkness and bad weather – a compelling reason to put efforts into developing the next generation of intelligent lighting systems with multi-functional swivelling headlamps. The aim is to improve visibility for the driver, thereby achieving a significant increase in road safety and driving comfort. Various studies on swivel-beam headlamps have shown up to a 300% increase in the illumination of the driver's gaze point as the vehicle turns into a corner.

Adaptive headlights are an active safety feature designed to make driving at night or in low-light conditions safer by increasing visibility around curves and over hills. When driving around a bend in the road, standard 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 according 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-levelling system that points the light beam up or down, according to the position of the vehicle.

Adaptive headlights are also sometimes called active headlights or adaptive front-lighting systems. The rate of accident are much and more at the night drive then at the day light, for avoiding the accidents these concepts are very useful for automobile. The reason has to why focus on the subject of producing the safety of car is related to the statics and to the expose the serious consequences of accident in 2014 out of 6,98,451 people from accident 4,882 people dead and remaining people has injured with a corresponding financial loss in India.

Adaptive headlight system moves the headlights by turning the vehicle through the steering. This places light into the turning radius visibility at the cornering improved. The present invention relates to headlights of an automobile, more particularly to a direction turning device for headlamps of the vehicle which enables to turn direction synchronously with the rotation of the steering and hence increasing the safety for driving at night or in the darkness. In the known technology of the prior art, a headlight of the vehicle has a fixed line of emission which is aligned with the front

direction of the vehicle. Although the effects of "high beam" or "low beam" can be achieved by adjusting the angle of elevation of the headlamp, the direction of emission is not adjustable as to the left or right. When the road curves or turns, the Savitribai Phule Pune University Dr. DY Patil School of Engineering and Technology, BE (Automobile) Page 10 corner on time when the vehicle turns, thereby creating a dead angle of illumination and such lack of visibility poses danger in driving at night or in darkness.

Therefore, it is highly desirable to invent a device to solve this problem and such device is of high utility. An object of the present invention is to provide a direction turning device for a headlight of the vehicle which renders to emission direction of a headlight of an automobile in synchronization with steering and thus increases the illuminated area upon changes of direction of the automobile when the automobile makes turns

II. RELATED WORK

[1] "Adaptive Headlight System for Accident Prevention" by Shreya's , Kithara Raghuraman¹, Padmavathy , S Arun Prasad, G.Devaradjane.

This paper focuses on the design and working of a microcontroller based Adaptive Headlight System (AHS) for automobiles. The main purpose of this system is to present a cost effective technique to illuminate blind spots while driving in the night and during the times when the visibility is reduced significantly so as to make the objects visible in those darkened locations and thereby prevent accidents. The system functions in accordance to the controlled input from Atmel AT89S52 microcontroller unit which drives the stepper motors connected to the headlights. The system is also designed to receive input from the indicator switch wherein a full turn is achieved by the headlight mirror when the indicator input is given. Also, the adaptive headlights are automatically switched on when the amount of light measured by a photo diode falls below a threshold, thereby eliminating the need for the driver to switch on the headlights.

[2] "A Review Paper on Intelligent Headlight System" by Prof. G.S. Dhumal, Abhay N. Shinde, Abhijeet R. Tad, Akshay A. Andhale, Prashant K. Pawar.

The topic of this project is steering controlled (or directional) headlights, that are usually a separate set of headlights fitted to road vehicles beside the usual low beam/high beam headlights and their feature is that they turn with the steering, so that the driver of the vehicle can see the bend, what he is actually turning into. These type of headlights appeared on production cars in the 1920's and are still around now a days, but not very popular, although they make night time driving safer. The most famous car which featured these lights was the Citroen DS (1955-1975), introduced on the 1968 Paris Motor Show. The headlights can be connected to the steering linkage by means of rods or cables, operated hydraulically by the power steering or now a days electronically adjusted, even controlled by satellite navigation system. Our project is to make new and modern Directional Headlights in efficient manner by increasing the light angle. right alone steers to right using spur and bevel gear mechanism and reduction gears & vice versa.

[3] "Design of Adaptive Headlights for Automobiles" by Priyanka Dubal, Mr. Nanaware J.D.

The highest fatal traffic accident rate occurs on curved roads at nighttime. 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 systems do not provide illumination in the right direction on curve roads. Due to this constrain, a need to understand an alternative technology solution. The aim is to improve visibility for driver and so achieve a significant increase in safety and driving comfort. This calls for a flexible front light for automobiles to illuminate road ahead in the night at corner. Adaptive front lighting system (AFS) helps improve driver's visibility at night time hence achieving enhance safety. AFS (adaptive front-lighting system) used to detect information about corner in advance with help of sensor which detect the information send it to motor to adjust headlamps to get the lighting beam which was suitable for the corner. Through this way, it could avoid "blind spot" caused by the fixed lighting area when coming into the corner, and improve driving safety. The existing conventional light systems do not provide illumination in the right direction on curve roads. Due to this constrain, a need to understand an alternative technology solution.

[4] "Adaptive Headlight System" by Vijay Mandal, Vellington Roy, Deepak Chandra, Shubham Yadu, Jitendra Yadav.

In present condition, highest fatal road accident occurs during night time. In most cases, late identification of upcoming objects becomes the main cause. These conditions give the forward headlight systems a key role in automobiles. In order to improve the visibility of upcoming objects, this work aims to enhance the front headlight system and build a prototype for steerable headlight system. It aims to replace the conventional headlight system with a steerable one. Components of this steerable headlight system were tested. Different types of test were done to improve its accuracy

and response time. Finally the results were discussed and the steerable headlight system was assembled. Four-wheeler driving always carries a lot of danger. Many things are related to vehicles and driving atmosphere like road texture, darkness, visibility, track unevenness.

III. OBJECTIVE

The primary objective of our research is to automatically adjust headlamp alignment and detect foggy condition in real-time improve visibility and reduce accidents.

1. Investigate Existing Technologies: Conduct a comprehensive review of existing automatic headlamp alignment systems and fog detection technologies to understand their capabilities, limitations, and areas for improvement.
2. Design and Development: Design and develop an innovative automatic headlamp alignment system integrated with fog detection, incorporating advanced sensors, control algorithms, and real-time adjustment mechanisms.
3. Validation and Performance Evaluation: Validate the performance of the developed system through simulation, laboratory testing, and real-world field trials, assessing key metrics such as alignment accuracy, response time, visibility improvement, and user satisfaction.
4. Comparative Analysis: Conduct a comparative analysis between the new system and traditional headlamp technologies, quantifying the improvements in visibility, safety, and driver convenience offered by the innovative features.
5. Driver Feedback and User Experience: Gather extensive feedback from test drivers to evaluate the usability, effectiveness, and acceptance of the new system in real-world driving scenarios, considering factors such as ease of use, comfort, and perceived safety benefits. These objectives guide the research paper's focus, methodology, and outcomes, ensuring a systematic and comprehensive investigation of the automatic headlamp alignment system with fog detection and its implications for vehicle safety, performance, and user experience.

IV. COMPONENTS

Gyroscope sensor

Motion sensors that detect the movement of people and objects are among Epson's sensing solution technologies. Gyroscopic sensors ("gyro sensors") are one type of motion sensing device. They are capable of sensing movements that are difficult for humans to detect, such as rotation and changes in orientation. The crystal elements in Epson's gyro sensors are made of high-quality quartz crystal grown by Epson and have a double-T structure. This makes it possible to detect quantities such as the direction of rotation, rotation angle, and vibration. Gyro sensors are found in smartphones, digital cameras, game consoles, car navigation systems, robots, industrial equipment, and wherever else features such as vibration detection, camera shake correction, and attitude control are needed. Gyro sensors are classified according to how they detect rotation.



Servo motor

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor although the term *servomotor* is often used to refer to a motor suitable for use in a closed-loop control system. Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing. A

servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft



Arduino UNO r3

Nowadays, with Microcontrollers being relatively cheap and readily available in the market, making a purchase decision on a suitable one to pick might a hard task to handle. However, there's one particular model that's good to start with for users. That model is the ATmega328p, an 8-bit AVR microcontroller.

ATmega328P is a high performance yet low power consumption 8-bit AVR microcontroller that's able to achieve the most single clock cycle execution of 131 powerful instructions thanks to its advanced RISC architecture. It can commonly be found as a processor in Arduino boards such as Arduino Fio and Arduino Uno.



Rack and Pinion

A rack and pinion is a type of linear actuator that comprises a circular gear (the pinion) engaging a linear gear (the rack), which operate to translate rotational motion into linear motion. Driving the pinion into rotation causes the rack to be driven linearly. Driving the rack linearly will cause the pinion to be driven into a rotation.

For example, in a rack railway, the rotation of a pinion mounted on a locomotive or a railcar engages a rack between the rails and forces a train up a steep slope. A generating rack is a rack outline used to indicate tooth details and



dimensions for the design of a generating tool, such as a hob or a gear shaper cutter. Rack and pinion combinations are often used as part of a simple linear actuator, where the rotation of a shaft powered by hand or by a motor is converted to linear motion.

Moisture sensor

This is an easy to use digital moisture sensor. the sensor it can measure moisture or water level content in it. It gives a digital output of 5V when moisture level is high and 0V when the moisture level is low in the air. The sensor includes a potentiometer to set the desired moisture threshold. When the sensor measures more moisture than the set threshold, the digital output goes high and an LED indicates the output. When the moisture in the air is less that the set threshold, the output remains low. The digital output can be connected to a micro controller to sense the moisture level. The sensor also outputs an analog output which can be connected to the ADC of a micro controller to get the exact moisture level in the air. This sensor is great for making water sensing, etc.

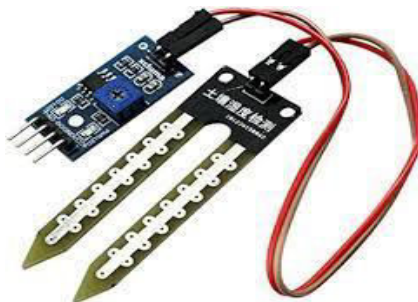
Relay

The Single Pole Double Throw SPDT relay is quite useful in certain applications because of its internal configuration. It has one common terminal and 2 contacts in 2 different configurations: one can be Normally Closed and the other one is opened or it can be Normally Open and the other one closed. So basically you can see the SPDT relay as a way of switching between 2 circuits: when there is no voltage applied to the coil one circuit “receives” current, the other one doesn’t and when the coil gets energized the opposite is happening.

V. METHODOLOGY

The methodology for developing the automatic headlamp alignment system with fog detection involves several key steps. Initially, sensors including gyroscopes, accelerometers, cameras, and fog sensors are installed in the vehicle prototype to collect relevant data. Software algorithms are then developed to process and analyze this data in real-time, integrating machine learning techniques for continuous optimization. Actuators are integrated into the headlamp assembly to enable dynamic adjustment of headlamp position and orientation based on sensor inputs. Concurrently, fog sensors are incorporated into the system to detect changes in visibility due to foggy conditions, with corresponding algorithms developed to trigger appropriate adjustments to headlamp intensity and pattern. The system's response is validated through both laboratory and field testing, ensuring its effectiveness in real-world driving scenarios. Additionally, user feedback is solicited through testing sessions to assess the system's usability and performance. This structured approach ensures the reliability, effectiveness, and user-friendliness of the system in enhancing road safety and driving experience.

VI. CONCLUSION



1. Technological Advancement: The development of an automatic headlamp alignment system with fog detection represents a significant technological advancement in automotive safety.
2. Addressing Challenges: Through systematic design and testing, the system effectively addresses challenges associated with headlamp misalignment and reduced visibility in foggy conditions.
3. The structure and work of adaptive headlight system from traditional static headlamps has been accomplished. what is more alternative existing mechanisms for steering. controlled light source such as electrically controlled mechanism, reconciling light source mechanism it is straightforward, economical and might be simply custom-made for the any king of vehicles.
4. It is our hope that this presentation has shed light on the importance of this innovation and the positive impact it can have on the lives of handicapped individuals in India

REFERENCES

1. Adaptive Headlight System for Reducing the Dazzling Effect to Prevent Road Accident by Anupriya Dubey, Anmol Gulati , Aayush Choubey, Sagar Jaikar, Pranav More.
2. <https://ieeexplore.ieee.org/abstract/document/9776464/authors#authors>
3. Review paper on Design and Analysis of Adaptive Headlight System by Umesh Subhash Salunke, Prof. Dr. Anand Relka
4. https://joirem.com/wp-content/uploads/journal/published_paper/volume-10/issue4/J_DFZDmhVI.pdf
5. Modeling and Fabricating Automatic Headlight Alignment System with Dim and Bright Control by S.Kumban, M.Rajkumar, K.Sudarshan.
6. Design of Adaptive Headlights for Automobiles by Priyanka Dubal, Mr. Nanaware J.D.
7. Adaptive Headlight System by Kishor Joshi, Shubham Chougale, Shubham Farakate, Bhuminandan Misal.
8. Weifeng Wang, Qing Wu, "Control Model and Simulation for Adaptive Front light System of Vehicle on Curve Roads" 2008 IEEE Vehicle Power and Propulsion Conference, 2010.
9. Adaptive Headlight System for Accident Prevention by Shreyas , Kirthanaa Raghuraman1, Padmavathy , S Arun Prasad, G.Devaradjane.
10. Review Paper On Intelligent Headlight System by Prof. G.S. Dhumal, Abhay N. Shinde, Abhijeet R. Tad, Akshay A. Andhale, Prashant K. Pawar.
11. Design of Adaptive Headlights for Automobiles by Priyanka Dubal, Mr. Nanaware J.D
12. Adaptive Headlight System Vijay Mandal, Vellington Roy, Deepak Chandra, Shubham Yadu, Jitendra Yadav..



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