Indian J.Sci.Res. 17(2): 121-125, 2018

ISSN: 0976-2876 (Print)
ISSN: 2250-0138(Online)

AUTOMATED HEADLIGHT SYSTEM USING EMBEDDED COMPUTING SYSTEM

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Abstract—Routine drivers would know the difficulty in driving on highways, in the night, because of the glare beaming from vehicles from opposite direction. Since drivers use high beams on national and state highways, it is a lot of nuisance for the incoming traffic on the opposite direction, but also critically helpful for travelling in plain roads. Furthermore, when a vehicle takes a deep turn, the headlight does not point to the direction that we are pursuing. Therefore, we propose an automation system that turns the headlight towards the concerned area when taking a steep turn. Automated headlight system using embedded system, provides way help fellow travelers from high beam glares by automatically detecting traffic from opposite direction and switching the light to low beam. This helps for the overall travelling drivers to have a better, safer driving experience and save them from trauma.

Keywords— Automated headlights, Arduino Uno, Potentiometer, Stepper motor, Bread board, TSL2561 Luminosity.

I. Introduction

The paper aims to design and fabricate a simple steering controlled head light system, 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 the front wheels pointed in the same direction at all times and it should be an effective replacement for existing conventional methods. If we steer the vehicle in right direction, the headlights will also focus to the right. Similarly if we steer vehicle towards left the headlights focus to left.

Moving the headlights from left to right or vice versa continuously corresponding to a potentiometer is achieved. An advantage of the developed headlight system is in its high adaptability as it can be easily configured to fit within space confines of a variety of vehicle designs. Indeed, the latter provides a bending lamp that allows for significant angular displacement of the light beam of a headlamp assembly without excessive light beam distortion and without the need to move the entire headlamp assembly. Furthermore, the system is of inexpensive, simple and dependable assembly.

This invention relates to vehicle headlight systems and in particular to a system for automatically controlling the switching of the headlights between the low beam and high beam settings. Improved automotive control systems have freed drivers from performing a number of tasks that formerly required manual operations. Such systems relieve drivers from the distractions of these auxiliary systems and often results in improved concentration as well as reduced driver fatigue. One such system which has seen limited use is an automatic headlight dim and dip system for controlling the headlamps of a vehicle.

II. Existing System

As we can see in our day to day life we can see cars with a stationary headlight. In some of the high end models of the car we can see a side light with the main headlight. This modern technology first appeared in 2003 on the Porsche Cayenne (fixed) and the Mercedes E-class (motorized). Soon other manufacturers followed them such as the BMW with the adaptive headlights and cornering lights and nowadays most of the main brands use such systems on their vehicles like Acura, Audi, BMW, Cadillac, Ford, Infiniti.

Volvo and Mazda Audi are experimenting with a system which uses satellite navigation, adjusts the headlights according to the road layout ahead the vehicle so as to assist the driver at the blind spots. Also while taking a look at the high beam low beam switching its completely manual the driver sometimes be negligent to switching these as required. Several automatic headlamp dimmer control systems have been proposed in the literature by automobile manufacturers but, from our knowledge, at the moment none of them are commercialized.

All the existing systems in automobile industry had the following drawbacks. They do not adapt to changing environments while driving automatically. This may cause a lot of nuisance to the users. For instance, the field of view perceived by the view is always limited and static.

III. Proposed System

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

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path is lit up. Similarly during a night time drive in a highway, driving right side of a one way has become too hard mainly because of the glare that is coming from a vehicle coming in the opposite direction, this may sometimes cause the driver to crash to the vehicle in front of him switching to low beam is the solution for it but people tend to forget it, So in our project we intend to automate this by taking the luminosity values from the opposite vehicle in turn reducing accidents.

Proposed system incorporates automation in the headlight rotation and dim and dip of headlights. This is to provide the following advantages. To enhance the field of view perceived by the driver, so as to enhance their driving abilities and overall road experience. Automated dim and dip is incorporated to avoid glaring the drivers and pedestrians due to high beam.

IV. System Architecture

After the system consists of multiple parts or stages which integrate modules to form the main system as shown in Fig. 1. Our approach makes use Arduino based system with stepper motor and LDR sensor module, for measurement and data acquisition of the surrounding environmental conditions which in turn helps in safer driving conditions. The Potentiometer used, simulates the steering values taken from the vehicle. It provides critical data required to turn the headlights based on the situation. The two modules work independently of each other. The two systems are both supported by a single microcontroller. The hardware design proposed is trivial and can support further changes in the components and structure. The components chosen are such that they sense the environment (luminosity) in most of the working condition. The microcontroller, Arduino is used as the core to program and interface the sensors. The Arduino programming environment facilitates the developer to manage, compile, upload, and simulate programs in a user-friendly environment

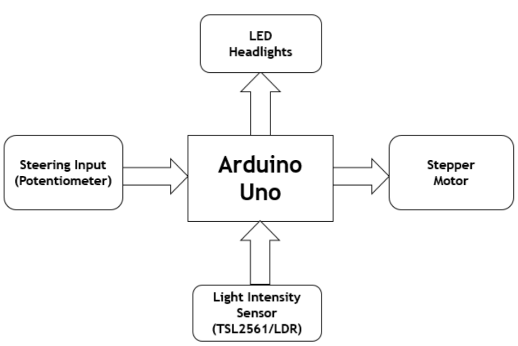

Fig. 1. System Architecture

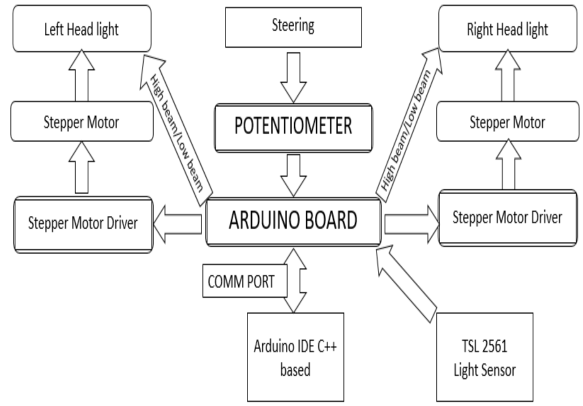

Fig. 2. Detailed Design

Coming to the design part, the arduino is the platform on which the entire code is loaded from the arduino IDE through COMM port it acts as the command centre, the potentiometer here is used for obtaining variable voltage hence here the potentiometer is assumed as the steering of the car, the potentiometer value is given to the arduino board which then the calculates the rotation angle as per the code given to the arduino, the calculated angle is then sent to potentiometer driver which is the controlling unit of the stepper motor, the headlights that need to be rotated is mounted on the stepper motor which is rotated. The other part is switching the beam of the headlight, here the luminosity sensor is used to read the variable intensity values coming from the surrounding, these values are sent to the arduino board where the arduino does the comparison of the values with the threshold value specified in the program, then the decision is taken by the arduino whether to switch to low beam or not then the headlights are controlled accordingly.

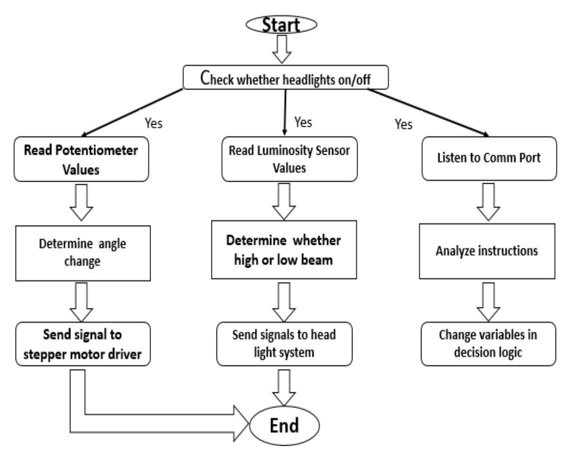

Fig. 3. Flowchart of the system

Firstly the headlight feature is checked whether it is in disabled state or not if it is in the disabled state, then both the features are not on, so this feature needs to be switched on. Coming to the flow of the program, first we need to read the analog values that is given by the steering mounted in the potentiometer, then it is going to determine the angle of otation with the help of the calculation mechanism written in the program also different angles need to be calculated for each individual headlight that is done here. The calculated value is then sent as a signal to the stepper motor deriver which is the controller of the stepper motor and rotates each individual headlight as calculated. Coming to the switching headlight to high and low beam, the input considered here is provided by the luminosity sensor.

V. Results

Fig. 4. Integration of subsystem

Fig. 5. Front view of the head light in high beam condition

Fig. 6. Appearance of the high beam condition on the wall

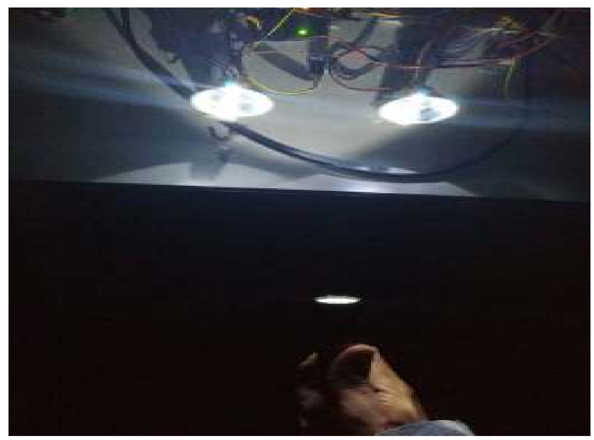

Fig. 7. Introducing a high intensity

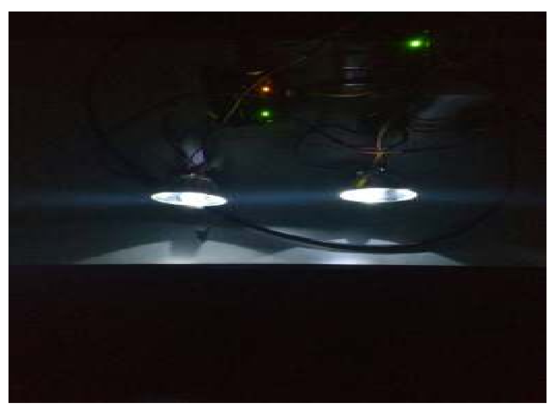

Fig. 8. Automated switching to low beam

Fig. 9. Front view of the head light in low beam condition

Fig. 10. Home condition of head lights

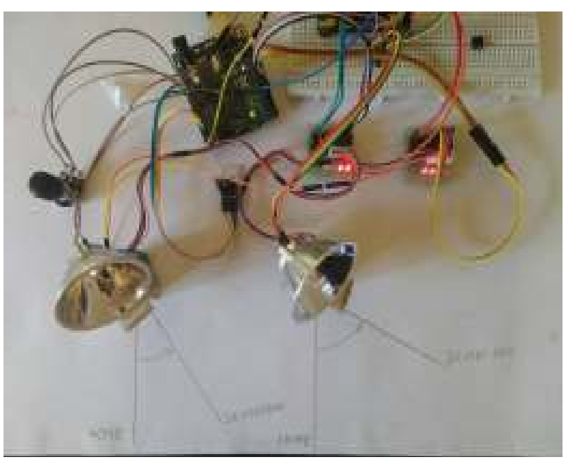

Fig. 11. Rotated condition of the head lights

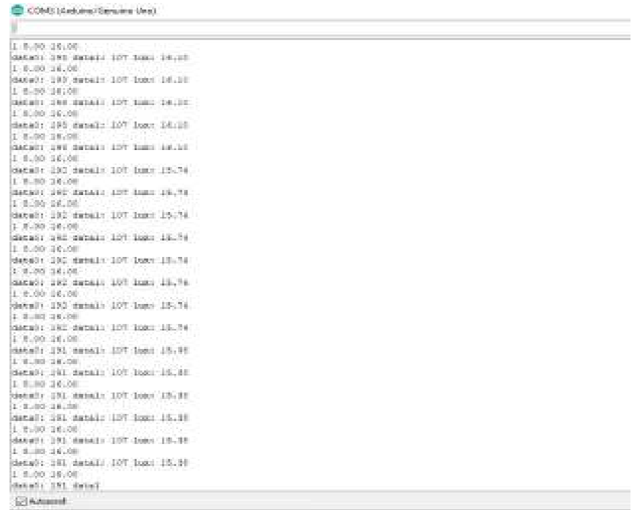

Fig. 12. TSL2561 Luminosity sensor values

VI. Conculsion

An automatic headlight dim and dip of on-coming vehicles had been designed using TSL2561 sensing technique. Thus, the system device automatically switches the headlight to low beam when it senses a vehicle approaching from the opposite side using TSL2561 Luminosity sensor. Glare during driving is a serious problem for drivers and therefore caused by the sudden exposure of our eyes to a very bright light of the headlights of vehicles. This causes a temporary blindness called the Troxler effect. Eventually this has become the major reason for accidents occurring at night and also during bad conditions such as rainy and foggy conditions. The driver should have turned down the bright lights immediately to avoid glare to the other person, however they find it difficult to do. Hence, the idea for the design and development of a prototype circuit called the automatic headlight dimmer. It enables the driver to use high beam light when required and also automatically switches the headlight to low beam when it senses a vehicle approaching from the opposite side. Thus, the implementation of this device in every vehicle does not only avoid accidents but also provide a safe and a comfortable driving. Therefore, our project aims to keep the core purpose of high beam lights, but also turn them down automatically while moving in heavy traffic, where it is not only unnecessary, but also causes trouble to travellers on the opposite lane. This project aims to strike a balance in this regard, using an automated system. Also, keeping in mind the issues that arise while taking a deep turn, we would also like to introduce automated rotation of headlights in x-y axis.

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