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AUTOMATIC ELECTROMAGNETIC BUMPER FOR FRONTAL CRASH PROTECTION WITH ADAPTIVE HEADLAMP SYSTEM

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Abstract- In this paper, an extendable and retractable bumper (E/R bumper) is presented. The E/R bumper is intended to automatically extend in situations in which there is a high risk of frontal impact to prepare the vehicle for crash and retract when the risk subsides. A functional demonstration vehicle and two experimental vehicles were built with the Electromagnetic E/R bumper. According to traffic accident data, the majority of severe road accidents occur at night. It is, therefore, of great importance to use available technology to contribute to road safety by improving the visual conditions provided by vehicle headlights. The Adaptive Headlight System is an active safety system, where the headlamp orientation control system rotates the right and left low beam headlights independently and keeps the beam as parallel to the curved road as possible to provide better night time visibility.

Keywords: *Electromagnetic Bumper, Ultrasonic sensor, Adaptive Headlamp, Servo Motor.*

I INTRODUCTION

In regular vehicles there is various mechanism operated for the braking system like use of hydraulic, pneumatic, or mechanical system. But all these braking mechanisms receive the input signal directly from the driver by application of force on brake pedal. Thus, braking of vehicles is totally manual operated. So, if the driver fails to see the obstacle in front of his driving vehicle or fails to apply proper braking force on the brake pedal, he may lose the control of his vehicle, leading to accident.

Also the driver may not able to pay complete attention when driving at night. So there are many chances of accidents. Urgent application of brakes can result in veering of the vehicles due to skidding of tyre. Moreover, due to sudden application of brakes there are chances of other vehicles dashing from back. Hence, there is no provision to minimize the damage of vehicles. Thus, the current designed system only fairly reduces the damage of vehicle and/or passengers.

1.1 Automated Braking System

An AEB system is made up of three key components; sensors to detect and classify objects in front of the vehicle, a control system to interpret the data from the sensors and decide when to intervene, and a braking system that allows the vehicle to be braked autonomously. The sensor types that can be used include RADAR, ultrasonic, infrared sensors, and video cameras. Each type of sensor has strengths and weaknesses with regard to the information supplied to the control system. Multiple sensors can be used in combination to collect more complete information on which to base decisions. For example, a camera may be used to aid the classification of objects, the relative location of which is detected by a RADAR sensor.

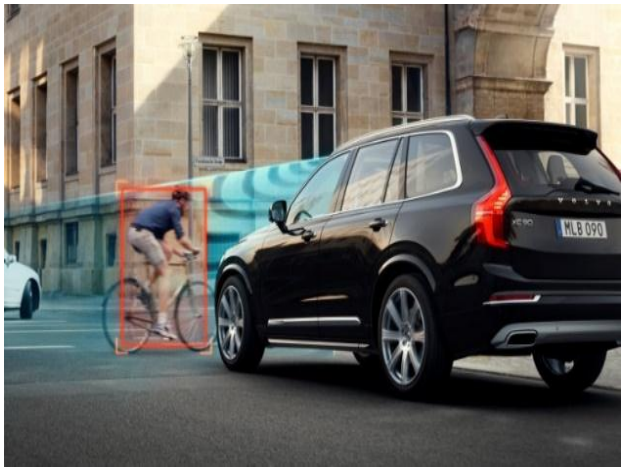

Figure 1 Automated Braking System

1.2 Automated Electromagnetic Actuation System

An actuator which works based on the electromagnetic principle for energy conversion is called as electromagnetic actuators. Electromagnetic actuators convert electrical and mechanical energy into one another. The energy conversion takes place in the so-called air gap which separates the ationary member (stator or fixed contact) and moving member (rotor or moving contact) of the actuator.

These actuators produce force and torque by means of magnetic field. Magnetic fields have higher energy density compared with electrical fields that's the reason for using magnetic fields in these sensors. The fundamental principles that govern electromagnetic actuators are faraday's laws of electromagnetic induction, Lorenz force of electromagnetic forces and Biot-Savart law. Since the control variable of this kind of actuator is the electric current fed by the power converter drives, so these can be easily controllable. Are used in many applications from precise control using small actuators to the quite large powerful units using electrical drives. The electromagnetic sensors consist of two major circuits, namely electrical circuit and magnetic circuit. The electric circuit establishes voltage and current according to the circuit analysis laws whereas magnetic circuit establishes the magnetic flux and magnetic field strength.

Figure 2 Electromagnetic Actuator

1.3 Adaptive Headlamp System

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 microcontroller unit which drives the headlights. The adaptive headlamp are automatically switched to upper and dipper when the amount of light measured by a LDR falls below a threshold, thereby eliminating the need for the driver to switch on the headlights. Also, as a steering wheel of car moves left and right thus headlamp of the Car moves left and right accordingly.

Figure 3 Adaptive Headlamp System

II METHODOLOGY

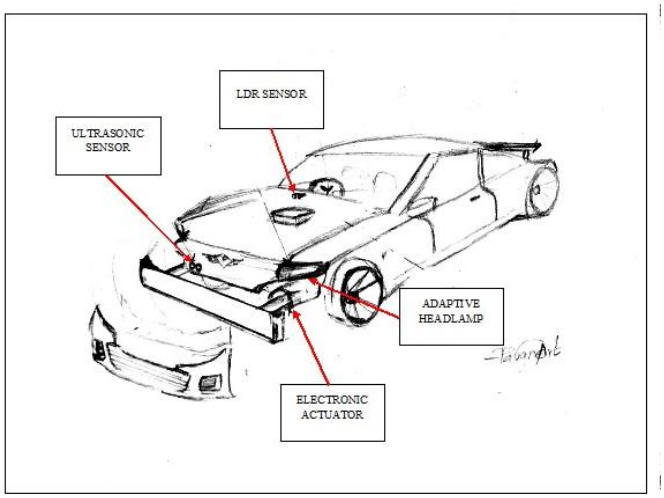

Figure 4 Adaptive Headlamp System

The systems consist of Ultrasonic sensor, and control unit. If vehicle is running on the road and suddenly an obstacle comes in front of the vehicle, then the Ultrasonic sensor gets activated and sends the signal to the control unit. After that the Ultrasonic sensor will detect the obstacle and suddenly signal is generated and transmitted to the control unit. And the control unit will apply the brakes and Due to this the one of the Electromagnetic cylinder piston is pushed forwards which is connected to

bumper and in this way the bumper expands and retracts and simultaneously.

Now assume our vehicle is running at night at this time when a car is passing the driver is not able to see the road due to upper headlamp of the front vehicle then there is chances of accidents. So in this system we have used the Light Dependent Register (LDR) to sense the upper headlamp of the front vehicle while passing in night. LDR sensor will get activated and gives the signal to control Unit and control unit will automatically moves the headlamp from upper to dipper of our car so front vehicle which is passing can able to see the road. And also while car is moving in Ghats. Due to the shape of road headlamp of car is always been focused to front the driver will not able to see road in Ghats so, there will be chances of serious accidents. In this system we have also used one Servo motor, as a steering wheel of car moves left and right thus headlamp of the Car moves left and right accordingly and further working is same as like in ultrasonic sensor, but to activate all this systems vehicle have to proceed a specific speed limit

III PROPOSED SYSTEM

3.1 Block Diagram

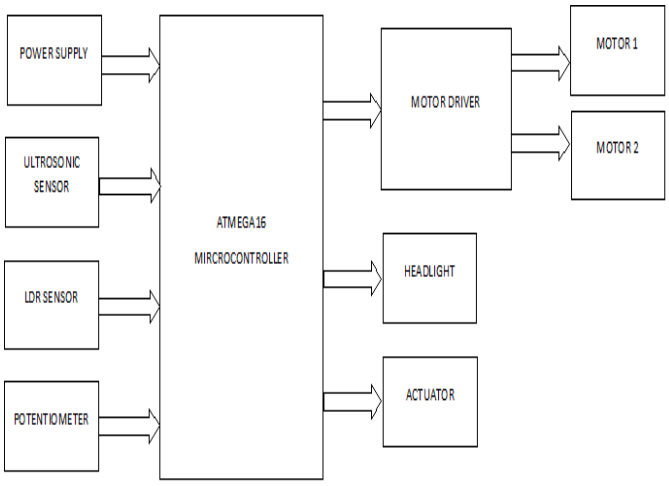

Figure 5 : Block Diagram

3.2 Block Diagram Explanation

In above Figure (Fig.5) Atmega16 is used as a Controller or to Process the input signals which are interfaced to controller the input devices are Ultrasonic sensor, LDR Sensor, Potentiometer. The information given by the input devices are process and controlled by the Atmega16 Microcontroller. Through that information microcontroller will control the output devices. The output devices are Motor driver, motor, Headlight and Electromagnetic actuator

The Power Supply is used to supply power to the Atmega16 Microcontroller, Here the Ultrasonic Sensor is used to measure the distance According to that microcontroller will perform the action of Electromagnetic Actuator. Thus the Actuator will be Expand and Retract

Here the LDR sensor is used to sense the light intensity of incoming vehicle, by sensing the intensity of incoming vehicle according to that it will changes its mode from Upper to Dipper and Vice versa.

The Potentiometer is used as Car Steering wheel so as the car steering moves in left or right direction according to that the headlamp will be moves left or right.

3.3 Experimental Hardware

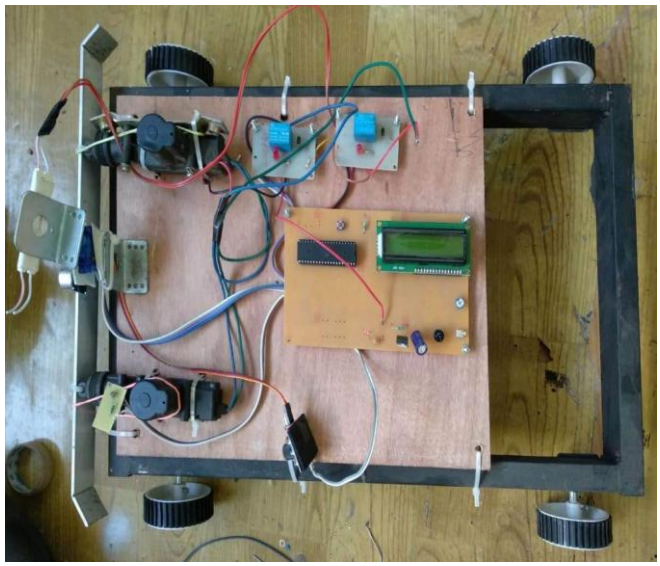

Figure 6 Experimental Hardware

IV CONCLUSION

Behind the designing of this system, our main aim is to improve the prevention technique of accidents and also reducing the hazard from accidents like damage of vehicle, injury of humans, etc. We observed that our work is able to achieve all the objectives which are necessary. Initial cost of cars with system is always high. Usually this system is given to high end cars. By implementing this project we can reduce cost of high end cars by giving similar kind of safety. These systems are helpful to provide internal safety to people sitting in vehicle, whereas in our project we will be giving internal plus external safety to car from damage. Thus we will reduce initial cost of cars and also provide better safety.

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