AUTOMATIC PNEUMATIC BUMPER SYSTEM

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I. ABSTRACT

Aim of the project is to design and develop a control system based an intelligent electronically controlled automotive bumper activation system is called "AUTOMATIC PNEUMATIC BUMPER". This system is consists of IR sensor, Control Unit, Pneumatic bumper system. The IR sensor is used to detect the obstacle. There is any obstacle closer to the vehicle (within 90 cm), the control signal is given to the bumper activation system and with the help of IR sensor pneumatic bumper actuate and brake is applied. In today's world accident are increasing day by day so to reduce accident to a certain level the sensor arrangement is applied to the bumper as when the obstacle will come in front of the sensor the brake can be applied and prevention of accident can be done.

Keywords: Pneumatic Bumper, IR sensors, braking system, wheels, Piston, Solenoid valve

II. INTRODUCTION

Vehicles are the revolutionary invention of mankind. With innovations in technology, they made their impression, in every aspects of life. Inflating demand for vehicles has led to substantial increase in number of vehicles. Safety of the vehicle is a major concern even from the design stage of the vehicle. Several technologies like seat belts and air bags have successfully worked out well in accidental situations and proved to be useful. Automated collision avoidance system is one among such system to avoid the severity of accidents. It is an electrically controlled pneumatic circuitry, which aims to avoid forward collision of the vehicle and improve crashing safety. This is achieved by means of automatic pneumatic circuits. The system senses the obstacle by means of high frequency Ultrasonic waves and calculates the distance between the obstacle and vehicle. The microcontroller signals for the actuation of pneumatic braking circuit and pneumatic bumper circuit simultaneously. Combination of these circuits effectively avoids collision and reduces the damage to be incurred by the vehicle.

Now a day vehicle accident is the major problem. The purpose of this system is based on intelligent electronically control automatic bumper known as "I.R sensor pneumatic bumper system". As well as this system improve the response time of vehicle bumping to keep safe distance between two vehicles.

III. PROBLEM STATEMENT

There are different braking system like hydraulic, pneumatic, air, mechanical, etc. But all these braking mechanisms receive the signal or input power directly from the driver so it totally manual operated. When the driver saw the obstacle or any vehicle in front of his driving vehicle, driver becomes hopeless and may forget to apply the brakes immediately. Due to this the driver fails to give the proper input to braking system and proper working is not occurs. Also the driver may not able to pay the full attention during night travelling so there are many chances to accidents. After the accident occurs, there is no any provision to minimize the damages of vehicles. In currently used vehicles generally bumpers used are of rigid types. These bumpers have specific capacity and when the range of the accidental force is very high then the bumpers are fails and these force transferred towards the passengers. So this system never reduces the damage of both vehicle and passengers. To overcome these unwanted effects design the Automatic Pneumatic Bumpers is important.

IV. OBJECTIVES

Automatic Braking System with Pneumatic Bumpers which has following objectives:

1. To increase the sureness of bumping Application
2. To increase the response time of braking system.
3. To improve the pre-crash safety.
4. To avoid the percentage of passenger injury by using external vehicle safety

V. Project System Components

1) Pneumatic actuator
2) Axles
3) Wheels
4) Bearings
5) Motor

1. Double acting pneumatic cylinder

   Pneumatic actuators are mechanical devices that use compressed air acting on a piston inside a cylinder to move a load along a linear path. Unlike their hydraulic alternatives, the operating fluid in a pneumatic actuator is simply air, so leakage doesn't drip and contaminate

   surrounding areas. The basic pneumatic cylinder consists of a chamber with a movable piston and intake and exhaust channels. When compressed air or other gas is pumped into the bottom of the cylinder, the gas expands, pushing the movable piston upwards and generating force. Pneumatic cylinders, also known as air cylinders, have advantages over hydraulics in some cases and are used in a wide variety of applications.

Fig. DACcylindrical

2. Solenoid Valve

A solenoid valve is an electromechanically-operated valve. Solenoid valves differ in the characteristics of the electric current they use, the strength of the magnetic field they generate, the mechanism they use to regulate the fluid, and the type and characteristics of fluid they control. The mechanism varies from linear action, plunger-type actuators to pivoted-armature actuators and rocker actuators. The valve can use a two-port design to regulate a flow or use a three or more port design to switch flows between ports. Multiple solenoid valves can be placed together on a manifold. Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high-reliability, long service life, good medium compatibility of the materials used, low control power and compact design.

Fig. Solenoid Valve

3. Wiper Motor

Windshield wiper motors are components in the car, that function on a power supply- with the task of moving wiper blades in a smooth and systematic motion. Just like other motors, the wiper motor functions to rotate continuously in one direction once it is converted to a back and forth motion. The standard voltage requirement for the wiper motor is 12 volts DC. The electrical system in a running automobile usually puts out between 13 and 13.5 volts, so it's safe to say the motor can handle up to 13.5 volts with no problem. Wipers are powered by a small electric motor, usually mounted on the firewall or under the cowl (the area under the windshield's base). The motor activates linkage that moves

the wiper arms back and forth. On vehicles with a rear window wiper, a separate motor powers the one in the rear.

Fig. The Wiper Motor

4. UNO Arduino Circuit

An Arduino board is a one type of microcontroller based kit. The first Arduino technology was developed in the year 2005 by David Cuartielles and Massimo Banzi. The designers thought to provide easy and low cost board for students, hobbyists and professionals to build devices. Arduino board can be purchased from the seller or directly we can make at home using various basic components. The best examples of Arduino for beginners and hobbyists includes motor detectors and thermostats, and simple robots. In the year 2011, Adafruit industries expected that over 3lakhs Arduino boards had been produced. But, 7lakhs boards were in user's hands in the year 2013. Arduino technology is used in many operating devices like communication or controlling.

Fig. UNO Arduino Circuit

5. Bearings

A bearing is a machine element that constrains relative motion to only the desired motion, andreduces friction between moving parts. A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.

Air compressor tubing specification:

- PU Hose; Material : Polyurethane

- Outside Diameter : 6mm/0.25";Inside Diameter : 4mm/0.15"

- Total Length : 8.5 meter /27.88Ft;Color : Blue

- Weight : 190g

VI. Working

In this we are going develop a system which will respond to the accident event to avoid severe damage to the occupants. In this system we are using pneumatic cylinder instead of hydraulic cylinder because fluid is a non-compressible element and the setup gets so robust and require high maintenance. These Pneumatic cylinders are actuated by the help of Solenoid valves. These solenoid valves are controlled by Arduino circuit. The pneumatic which installed behind bumper is actuated bythe solenoid valve connected to Arduino circuit. When the IR sensor gets obstructed by the obstacle the rays of IR sensor gets blocked. To this blockage the signal is provided to the Arduino circuit and the Arduino circuit reacts to the signal and gives signal to solenoid valve which operates the flow of compressed air the pneumatic cylinder. As the pneumatic cylinder is Actuated the Bumper slides forward to absorb more impact energy than usual.
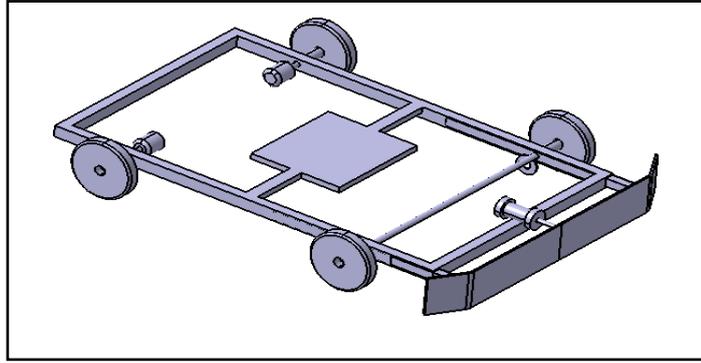
CAD Model
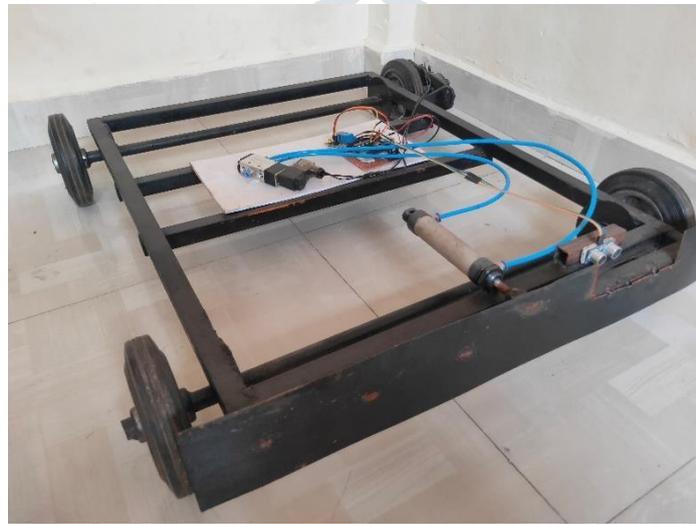
Actual Model

VII. Future Scope

Our future work deals with incorporating this system with various different features to provideenhanced protection by The intelligent braking system in real time application. For that, some of the possible changes are: 1.

1. Regular bumpers can be replaced by hydraulic bumpers.

2. Infrared sensors can sense eye blinking and give signal to solenoid valve when driver sleeps.

3. Limit switch can be used to limit the minimum speed above which the system gets triggered.

4. PIC can be implemented in system for further modifications like gradual slowdown of vehicle.

5. Bumper design can further be enhanced to act as external air bags.

6. With some modifications, the project can be used with timer circuits so as to apply brakes andextend the bumper after a delay

of few milliseconds so that the bumper does not extend unless the vehicle just reaches the crashingdistance.

7. In case of over speeding the system will activate automatically.

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VIII. Conclusion

We observed that our work is able to achieve all the objectives which are necessary. Initial cost of carswith air bags is always high. Usually air bags are given to high end cars. By implementing this projectwe can reduce cost of high end

cars by giving similar kind of safety. Air bags are helpful to provide internal safety to people sitting in vehicle, whereas in our project we will be giving internal plus externalsafety to car from damage. Thus we will reduce initial cost of cars and also provide better safety.

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