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Autoguided Accident Avoiding Bumper Vehicle

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Abstract: In today's busy world, road accidents are a severe problem. In this paper we have introduced an innovative idea which could help us to reduce fatalities due to accidents. Our paper is based on the mechanism of Rack and pinion which is fitted inside the bumper of a car. This bumper can increase the time of impact and hence reduce the impulse or shock from an accident. This mechanism can be used along with the current system such as air bag and anti-breaking system. Also we have used GSM module to alert the person's relatives and ambulance when any accident happens.

Keywords: Rack and pinion; GSM; accident prevention; innovative design; safety features

I. INTRODUCTION

We are living in a country with a very large population which results in large number of vehicles owned by the people of the country. It in turn increases the probability of accidents on the road due to excessive vehicles. There are various causes of accidents, not only large numbers of vehicles are to blame but sometimes it happens due to someone's negligence or carelessness. In India it was recorded in 2016 that at least 4,80,652 accident happened which resulted in 1,50,785 deaths. So we need a very reliable system to prevent fatal injuries to the person involved in an accident. It was also reported that 34.5% accidents happens on the National Highways and

27.9% accident happens on State Highways. Based on these facts we are introducing an innovative idea to reduce the causalities and we are introducing a system which can be integrated along with current safety features.

In our paper we have proposed an idea using Rack and pinion mechanism and we have designed this on a microcontroller controlled car. This system is included in the bumper of the car so it can be installed easily without affecting other safety features. Whenever any accident happens the bumper will come out and it will slowly retracts to its initial position which increases the time of impact and the person will get less shock. Along with the air bags the person will get maximum safety. So in our paper we are providing safety from the outside and the air bag system is providing safety from the inside. We have also included a GSM module which will automatically call the person's relative and ambulance whenever any accident happens. The call will be generated right after the bumper system is used which allows the ambulance to reach the spot in quick time.

We know that maximum of the accidents happens on the highways, so we have included 2 operating modes, Automatic and Manual. The automatic mode is for the highway where the system will be enabled and the manual mode is for streets and narrow roads where the system is disabled. Along with these safety features we have included seat belt safety system which does not allow the engine to start if the driver does not put on the seat belt. Also we have included a door sensor which senses if the door is properly locked or not.

II. LITERATURE REVIEW

The major increase in number of vehicles and the increase in vehicle collisions, has led to the need for the development of advance collision avoidance systems. For the development of such system a lot of ideas were put up.

- 1) *Jianping Liu:* This paper is aimed to put forward the design points of the hood system frontal collision safety performance. The motive of this paper was to prevent collision between the hood and windshield, which could cause the failure of the airbag burst and cause damage to the occupant in a motor vehicle frontal collision. For this they ensure that the hood, hood latch, hood striker and the body structure to be effectively connected, and will not be tore in a motor vehicle frontal collision. Further it frequently checks the stress and strain of the parts in the simulation of CAE analysis. Also they ensure that the hood should be able to effectively collapse in a motor vehicle frontal collision and the hood collapse shape should be an "n" or a "A" shape. They also ensure that the layout of the hood collapse groove position should be in the central region between the hood latch engagement point and the hood hinge shaft. They reasonably design the size of the hood collapse grooves and arrange the layout of the collapse grooves from left to right under the condition of meeting the requirements of the hood modal and the hood stiffness. The only shortcoming of this idea is that it not cost effective and if implemented will only augment the price of the vehicle

- 2) *Bohuslav Busov, Milada Bartlova*: This paper presents the use of TRIZ methodology and Goldfire Innovator for improving the active hinge of the car bonnet. The hinge is one of the primary components through which the pedestrian protection is increased. The results were measured from the EuroNCAP after testing the safety of vehicles in a collision with pedestrians, especially in city traffic, in pedestrian crossings, where the most accidents are occurs. The paper also introduces a significant improvement in product design system– the active hinge of the car bonnet. The active hinge is used to lift the rear part of the bonnet in appropriate short time to extend the deformation space between the bonnet and the rigid parts of the engine compartment. Fast and controlled lifting of the bonnet dwindles the consequences of collision between pedestrian and the vehicle. The only pitfall of this system is that if implemented will increase the complexity
- 3) *Yuichi Saito, Pongsathorn Raksincharoensak*: This paper proposes a control system based on potential risk prediction of collision with a pedestrian on urban roads. The system performs a deceleration control in uncertain situations that a moving object, i.e. pedestrian, might intend to cross the road. But the problem with such an early intervention support is that it is not clear whether the system is allowed to implement the deceleration control autonomously in uncertain situations and whether the driver would accept the assistance system’s decision and action. Their study investigates the functionality and effectiveness of the early intervention support under a driving simulator experiment. The only con of the system is that it is useful for elderly people.
- 4) *Wiwik Budiawan, Adimas Prakoso, Arfan Bakhtiar, Pertiwi Andarani*: The proposed design in this paper is Frontal Protection System (FPS). Whose primary function is to protect pedestrian when collision occurs between pedestrian and car and to reduce the injury suffered by the pedestrian .The proposed design was based on Alkano that mentioned that the height of the bumper, which was adjusted to below the knee because it could wane the injury suffered by the pedestrian when collision occurred. This design was mounted on the front of the car without eliminating components of the front of the car. The design was made by adjusting the shape of the car so it did not affect the component existed at the front of the car, such as lights, fog lights, turn signal lights, and license plate number of the car.

III. PROPOSED SYSTEM

Our proposed system has 3 IR Sensors placed at the front body of the vehicle. Two of them are used to detect the presence of a body/vehicle on either side of the vehicle- left or right. If the sensor detects presence of a body/vehicle, the information is send to the microcontroller which in turns makes a decision to move the vehicle in left direction or in right direction.

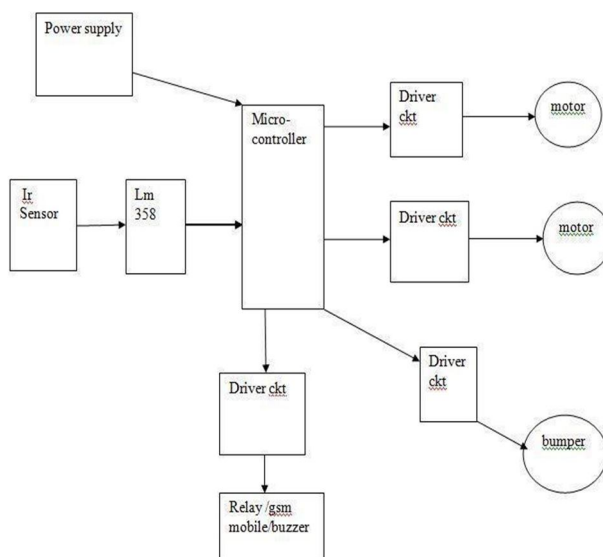


Fig 1. BasicBlock Diagram of the proposed system

The Third IR Sensor detects the presence of a body/vehicle in front of the vehicle. If presence of a body/vehicle is detected, the information is passed to the microcontroller which makes the decision to move the bumper of the vehicle in the forward direction. This is done so in order to minimize the impact of collision between two vehicles. Presence of any vehicle will be detected by the sensor when either of the two cases happens:-

- 1) Our driving vehicle has encountered some malfunctioning in the braking system and there is surely going to be an accident with the vehicle in front of us.
- 2) There is already an accident situation in front of us and we are approaching the scene of accident rapidly and the driver panics and loses control of the car.

In either of the situation, the Automatic Bumper System will function and the vehicle's bumper will be shifted forward in order to minimize the impact of an accident and thus saving the human life. The system is supposed to work both on streets and highways. A test case may occur when the driver is trying to park his/her vehicle in garage/against any wall. The front IR sensor will detect the presence of body (an IR Sensor cannot differentiate between a wall or a vehicle). In this case the automatic bumper will be directed by the microcontroller to move forward. This will result in an unwanted collision of the bumper with the wall. In order to overcome this shortcoming, there is a switch provided in the system which redirects the microcontroller to stop making the bumper move forward. The driver can select either of two mode-Highway Mode or Street Mode. The Street Mode is intended to stop the microcontroller for moving the bumper forward automatically. While the Highway Mode works as normal automatic smart bumper system.

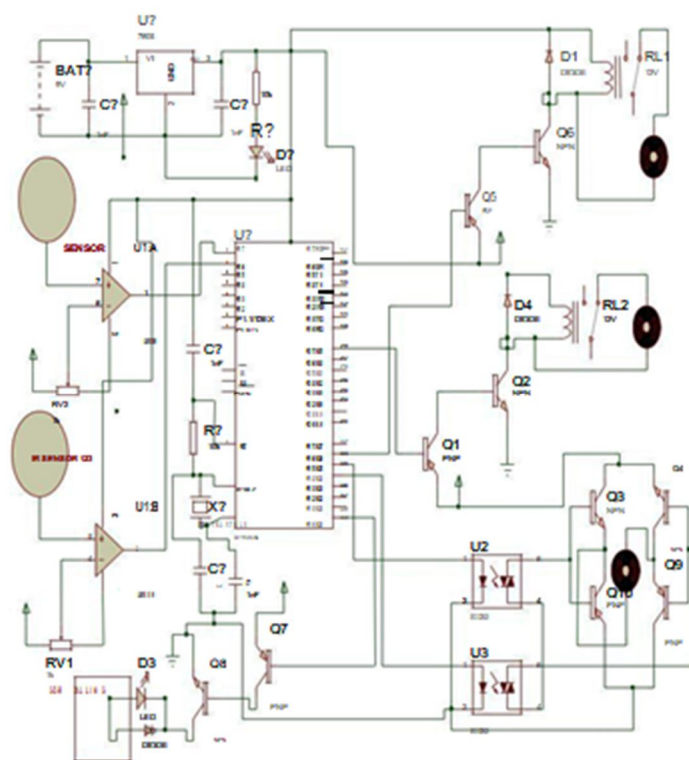


Fig 2. Circuit Schematic Diagram

IV. CONCLUSION

This mechanism can be implemented in the near future effectively. We have witnessed some fiasco cases of airbag system and with the pervasive nature of accidents all over the world there is a need to thwart it as soon as possible, someone has to implement extra security to ensure the safety of the people so we came up with an idea of using rack and pinion mechanism. This mechanism will not only ensure the safety of people but also the safety of the vehicle. This paper will prove to be a boon for mechanical industry and will help our country to gradually decrease the amount of deaths

V. FUTURE SCOPE

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

- 1) Ultrasonic sensors can be used in place of Infrared sensors.
- 2) Infrared sensors can be used to sense eye blinking and give signal to system whenever driver sleeps.



- 3) A switch can be used to limit the minimum speed above which the system gets triggered.
- 4) Bumper can be replaced by hydraulic bumpers.
- 5) PIC can be implemented in system for further modifications like gradual slowdown of vehicle.

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