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Automatic Reverse Braking System

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ABSTRACT - Now-a-days safety is become important aspects of automobile industries. And automation is the key which keep the safety at our fingers. In other words, an unskilled or less exampled can handle the automobile vehicle with greater with safety. Various accidents happen with the automobile vehicles which cause serious injury, and inefficient braking is most probable reason. It is incontestable, statistically proved fact, that year on year incidents involving a reversing vehicle account for between 20-30% of all reported work related serious injuries or fatalities.[1]While parking or taking reverse turn, driver unable to see what is behind the vehicle and obviously up to what distance, eventually vehicle strike with the obstacle behind.[7]Presently, cars have the alarm system where when the car gets too close to an object an alarm is triggered which warns the driver about an object close by. But this feature has produced lot of problems and is prone to human error. We have enhanced the facility by using the same system but we have altered it so that the car brakes automatically when an obstacle is close by. [5].

This seminar introduces a control systems based on electronically controlled automotive braking system is called "Intelligent Reverse Braking System". A Sensor Operated Pneumatic Brake consists of IR transmitter and Receiver circuit, Control Unit, Pneumatic breaking system. The IR sensor is used to detect the obstacle. There is any obstacle in the path, the IR sensor senses the obstacle and giving the control signal to the breaking system. The pneumatic breaking system is used to brake the system. So basically here the car brakes on its own by determining the distance from the object.

Key Words: Automatic braking, FPGA sensors, , Sensing circuit , Control unit.

I. INTRODUCTION:

An automatic reverse braking system is compiled with IR sensor circuit which operates a pneumatic braking system. The main target for this project is cars can run reverse automatic braking due to obstacles when the sensor senses the obstacles. The braking circuit function is to brake the car automatically after received signal from the sensor. This mainly concern in replacement of human effort by the mechanical braking. So it is the best safety feature for the vehicles. The pneumatically braking system stops the vehicle in 2 to 3 seconds when speed running speed is of 50 Km and the distance of stopping the vehicle is 1.6m. The Intelligent braking system is fully automated. To allow the driver to park the vehicle in tight place, it has parking mode system. In this mode sensor sensing length is reduced to 40cm distance.

Degrees of automation are two types:
1. Semi Automation
2. Full Automation

The semi automation is manual efforts with mechanical power whereas in full automation manual participation in the work is very negligible. Intelligent automatic reverse braking is of full automation type automation.

1.1 NEED OF AUTOMATIC REVERSE BRAKING:

Years ago, when car is get too close to an obstacle an alarm is triggered which worn the driver. In this process human error is also included. The actual time to stop the car is response time taken by the driver plus the time required to taken by the braking system to brake the car and time of response of driver is much greater.

1.2 BENEFITS TO THE CUSTOMER :

Intelligent reverse braking system offers the safe driving with reliable reverse braking. As it uses pneumatic force to operate the brake, it does not require any manual force which consequently reduces the fatigue in braking Driving is a

compulsory activity for most people. People use their car to move from one place to another place. The numbers of vehicles are increasing day by day. Proportionally, the numbers of accidents are also increasing. Accidents cause worse damage, serious injury and death. They are mostly caused by the delay of the driver to hit the brake. The use of electronic components in automobiles is set to accelerate and with ongoing efforts to improve safety and comfort. Cars makers in many countries have contributed to automobiles technology by developing systems such as rear view camera system, road-to-vehicle and inter vehicle communication system, auto-parking system and new car technology for intelligent cars such as intelligent transport system, hybrid car, electric car and hydrogen fueled car. Around 250 electronic components are presently being used in a car. Therefore, a system is proposed which will help in enhancing the performance of vehicles and thus contributing to the upcoming automobiles technology. To develop safety, when car gets too close to an obstacle, an alarm is triggered which may warn the driver. In this process, human error is also included. The actual time to stop the car is response time taken by the driver plus the time required by the braking system to brake the car and time of response of driver is much of a greater influence. Hence, it is required to make an automatic reverse braking system. Pneumatically operated reverse braking which is activated when ultrasonic sensors sense an obstacle. A problem that often concerned by the driver is the areas which cannot be seen by side view and rear view mirrors, which is called as blind spot region of vehicle. Vehicles in the adjacent lanes of the road may fall into these blind spots, and a driver may be unable to see adjacent vehicle using only the car's mirrors. Other areas that are sometimes called blind spots are those that are too low to see behind and in front of a vehicle. Also, in cases where side vision is hindered, areas to the left or right can become blind spots as well. In several accident cases, it has happened because of driver's inability to monitor the blind spot region well. The main objective for this project is that the car can automatically brake when driving in reverse due to obstacles when sensor senses the obstacles. And also to eliminate the blind spot regions by sensing the vehicle in sideways by the sensors and reducing the accidents and the driver could safely change the lane on roads. This system is mainly divided into two categories according to operation. Electronic operation for the detection of obstacle behind the car, the ultrasonic sensor transmitter and receiver circuit is required. The output from this circuit is sent to the solenoid valve which helps in pneumatic braking. Mechanical operation, when ultrasonic sensor gives input to solenoid valve via circuit board, then pneumatic brake is applied to the car. For this operation, pneumatic force is used to apply the brake. In this work the mechanism has been developed to stop the vehicle from rolling backwards when the vehicle is moving in the hill roads. Ratchet and Pawl mechanism has been identified to arrest the motion to the front axle. Anti-Roll Back mechanism has been fabricated and tested on the front axle assembly. The mechanism works well. Ratchet and pawl mechanism is used in many applications effectively where the one side power transmission is required. The project was divided into two phases. The First phase is to demonstrate the application of MEMS. The second phase of the project attempts controlling motors. The proposed mechanism is to reverse brake using ratchet gear. By reverse locking the differential is disengaged from the axle. Thus the power is directly transmitted to the axle and hence to the wheels. This will considerably reduce the power loss in some occasions when unwanted loss is happening due to the transmission if power from the shaft to the ratchet gear and then to the axle and hence to the wheels. So in mechanism the unwanted power loss in the due course of transmission through the gear wheel is reduced.

II. LITERATURE SURVEY :

There have been considerable advances braking systems in recent years. Designers have reposed several enhancement strange radar system was developed for anti applications here automatic braking is applied in response to detection of a collision risk where a very high probability of detection is accompanied by a very low level of false alarms. A brake strategy for an automatic parking system of vehicle has proposed brake controller which work with the automatic parking system and make the process of parking smooth andstable.

Autonomous antilock braking system (ABS) system which can take over the traction control of the vehicle is developed for a four wheel vehicle. ABS is a braking system that maintains control over the directional stability of the vehicle during emergency braking or braking on slippery roads by preventing wheel lock-up. MTS-20152277-9477 Safer using which can avoid the system.

PROF DIVYA THAKUR

Auto-Braking System using Sensor was proposed prevent front-end, rear-end, right-turn and left on

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roads. This module can detect the distance between front vehicle and driver's vehicle to keep a constant distance using a sensor and operate the brake system. All the above proposed design models contributed to safety of vehicles and pedestrians. It prevented rear end crashes , provided ABS for sharp turns or slippery roads. But al are applicable for vehicles running in conventional direction, so we need to develop systems which enhances the performance and safety of vehicles when it moves in reversedirection.

A model designed on reversing of vehicles provided detection of obstacle, speed control mechanism based on binocular cameras. Thus, in this paper we propose "Automatic Reverse Braking system" to prevent collision by using sensors to detect obstacles. The "Automatic Reverse Braking

III. CONSTRUCTION :

The system comprises of the following :

1) Chassis or Frame :

The chassis or frame is fabricated structure that carries the entire system rear wheel shaft is the driver shaft, that carries the reduction pulley driven by motor using a open belt drive.

2) Motor :

Motor is the prime mover; it is single phase AC motor 50 watt, 0 to 6000 rpm Variable speed. Motor speed is regulated using electronic speed regulator.

3) Collision sensing mechanism :

The over speed sensing mechanism is in the form of an Photo electric sensor with variable sensing range

4) Photo-electric sensor :

The photo electric sensor is mounted on the sheet metal panel on the base frame by Means of a Z shaped clamp. The photo-sensor as the name suggests senses the proximity of the obstruction which acts as stops, such that when they come in front of the photo sensor the Relay is operated to stop the vehicle motion. The photo- sensor is connected to the electronic relay and the power source.

5) Sensor type :

Photo electric sensor -Size: M18

Fig. No.1-Photoelectric Sensor

6) Electronic Relay :

8 Pin electronic relay MK2PN-5-I-S, 230V AC , 10 A. Electronic relay is used for the sequencing of the actuation mechanism.

Fig N0.2-Electronic Relay

7) Electronic Speed Regulator :

Motor is a commutator motor i.e., the current to motor is supplied to motor by means of carbon brushes. The power input to motor is varied by changing the current supply to these brushes by the electronic speed variation; thereby the speed is also is changes

8) Braking Mechanism :

The braking mechanism uses a Disk brake and brake caliper arrangement. The Disk brake is used with the view to maximize the braking and ensure safety. The brake Caliper is actuated electrically using an solenoid, with electromagnetic operation.

Collision warning indicator lamp and or Hooter :

This is the indication or alarm system, the lamp is a red LED lamp that flashes when over speed occurs, similarly the hooter is a horn or buzzer arrangement that goes on after stop recognition occurs there by alarming the operator.

IV. WORKING :

System starts with motor starting motor speed controlled by electronic speed regulator as vehicle moves forward the resultant gap between obstruction and the proximity sensor exceeds the permissible limit which makes the relay to operate and consequently the following actions take place

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a) Motor power is cut-off .
b)Braking mechanism is actuated to operate the shoe brake cam Linear actuatormechanism .
c)Motorized steering actuates to change course oftrack .
d)After the stop indicator is bypassed the vehicle moves on straight track till next stop indicator is encountered .

Solenoid Specifications :
Voltage : 230 V AC
Load : 1.5 Kg
Stroke : 25 mm

Fig. No.3-Solenoid

Working of solenoid–
When electric current is passed to the solenoid, magnetic field is developed which pulls the, Ram of the solenoid behind and thus ram which is connected to the brake lever is pulled back to apply the brake.

V. DESIGN OF EXPERIMENT SETUP :

Design consists of application of scientific principles, technical information and imagination for development of new or improvised machine or mechanism to perform a specific function with maximum economy & efficiency.
Hence a careful design approach has to be adopted. The total design work , has been split up into two parts;

- System design
- Mechanical design

System design mainly concerns the various physical constraints and ergonomics, space requirements, arrangement of various components on main frame at system, man + machine interactions, No. of controls, position of controls, working environment of machine, chances of failure, safety measures to be provided, servicing aids, ease of maintenance, scope of improvement, weight of machine from ground level, total weight of machine and a lotmore.
In mechanical design the components are listed down and stored on the basis of their procurement, design in two categories namely,
Designed Parts
Parts to be purchased

For designed parts detached design is done & distinctions thus obtained are compared to next highest dimensions which are readily available in market. This amplifies the assembly as well as postproduction servicing work. The various tolerances on the works are specified. The process charts are prepared and passed on to the manufacturing stage.

The parts which are to be purchased directly are selected from various catalogues & specified so that anybody can purchase the same from the retail shop with given specifications.

SYSTEM DESIGN :
In system design we mainly concentrated on the following parameters: -
1. System Selection Based on Physical Constraints:

While selecting any machine it must be checked whether it is going to be used in a large-scale industry or a small-scale industry. In our case it is to be used by a small-scale industry. So space is a major constrain. The system is to be very compact so that it can be adjusted to corner of a room. The mechanical design has direct norms with the system design. Hence the foremost job is to control the physical parameters, so that the distinctions obtained after mechanical design can be well fitted intothat.

2. Arrangement of Various Components :

Keeping into view the space restrictions the components should be laid such that their easy removal or servicing is possible. More over every component should be easily seen none should be hidden. Every possible space is utilized in component arrangements.

3. Components of System :

As already stated the system should be compact enough so that it can be accommodated at a corner of a room. All the moving parts should be well closed & compact. A compact system design gives a high weighted structure which is desired.

4. Man Machine Interaction :

The friendliness of a machine with the operator that is operating is an important criteria of design. It is the application of anatomical & psychological principles to solve problems arising from Man – Machine relationship. Following are

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some of the topics included in this section.
1. Design of foot lever
2. Energy expenditure in foot & hand operation
3. Lighting condition of machine.
4. Chances of Failure :

The losses incurred by owner in case of any failure are important criteria of design. Factor safety while doing mechanical design is kept high so that there are less chances of failure. Moreover periodic maintenance is required to keep unit healthy.

6. Servicing Facility :

The layout of components should be such that easy servicing is possible. Especially those components which require frequents servicing can be easily disassembled.

7. Scope of Future Improvement :

Arrangement should be provided to expand the scope of work in future. Such as to convert the machine motor operated; the system can be easily configured to required one. The die& punch can be changed if required for other shapes of notchesetc.

8. Height of Machine from Ground :

For ease and comfort of operator the height of machine should be properly decided so that he may not get tired during operation. The machine should be slightly higher than the waist level, also enough clearance should be provided from the ground for cleaning purpose.

9. Weight of Machine :

The total weight depends upon the selection of material components as well as the dimension of components. A higher weighted machine is difficult in transportation & in case of major breakdown; it is difficult to take it to workshop because of more weight

PRIME MOVER SELECTION :

Motor is an Single phase AC motor, Power 50 watt , Speed is continuously variable from 0 to 6000 rpm. The speed of motor is varied by means of an electronic speed variator. Motor is an commutator motor i.e., the current to motor is supplied to motor by means of carbon brushes. The power input to motor is varied by changing the current supply to these brushes by the electronic speed variator; thereby the speed is also is changes. Motor is foot mounted and is bolted to the motor base plate welded to the base frame of the indexer table.

NOTE : The above motor is selected with the view that the input power of the motor when varied will vary the motor speed and torque, just as in case of engine where in torque and speed can be varied by pressing the accelerator pedal, in our case the electronic speed variator resembles the accelerator.

DESIGN OF BELT DRIVE :

Selection an open belt drive using V-belt;
Reduction ratio = 5
Planning an 1 stage reduction;
A. Motor pulley (D1)=20mm
B. Main shaft pulley (D2)=100mm

INPUT DATA :

INPUT POWER = 0.05KW
INPUT SPEED =1000 RPM
CENTER DISTANCE = 210 MM
MAX BELT SPEED = 1600 M/MIN = 26.67 M/SEC
GROOVE ANGLE (2) = 400
COEFFICIENT OF FRICTION = 0.25
BETWEEN BELT AND PULLEY ALLOWABLE TENSILE STREES = 8 N/mm2

DESIGN (selection of LH wheel shaft bearing)

In selection of ball bearing the main governing factor is the system design of the drive ie; the size of the ball bearing is of major importance; hence we shall first select an appropriate ball bearing first select an appropriate ball bearing first taking into consideration convenience of mounting the planetary pins and then we shall check for the actual life of ball bearing.

DESIGN (selection of RH wheel shaft bearing)

In selection of ball bearing the main governing factor is the system design of the drive i.e.; the size of the ball bearing is of major importance; hence we shall first select an appropriate ball bearing first select an appropriate ball bearing first taking into consideration convenience of mounting the planetary pins and then we shall check for the actual life of ball bearing .

VI. ADVANTAGES AND APPLICATION :

ADVANTAGES :

1. The system eliminates the possibility of collision within given permissiblelimits
2. Ensures safety of the operators as automatically speed isreduced,.
3. Reduces brake wear and tear as no need of

excessive braking force to keep vehicle speed incontrol
4.System components involve simple and cost effective components hence simple production.
5.Low system cost as low level electronics isused.
6.No computing / /microprocessor involved keeps the system costeffective.
7. Can be easily implemented in both commercialLCV/MCV/HCV.
8. Minimal space requirements. Hence modifications in conventional system is reduced further increases the adaptability ofsystem
9. Visual indication in the form of indicationlamp.
10.Audio indication in the form of hooter…increases operator vigilance andsafety.

APPLICATION :
1. In –plant materialtransfer.
2. Ware houses and pack houses for materialtransfer
3. Hospitals and other medicalfacilities.
4. Malls and retailstransport.
5. Automobileindustry.

VII. CONCLUSION :

The whole system works only while reversing the vehicle. When the sensor senses any obstacle behind the vehicle, it sends signal to the control unit (FPGA). FPGA which act as a controller logic is designed with the help of FSM, which will sense the object according to the digital input and action will be taken accordingly. Thus we have developed an "AUTOMATIC REVERSE BRAKING SYSTEM" to prevent collision by using sensors to detect obstacles. The "Automatic Reverse Braking system" is processing the sensor data and controlling the vehicle to prevent accidents caused by careless driving or difficulty in detecting objects in reverse path. The system is probably the most reliable means of detecting human beings and objects and, therefore, invaluable in the prevention of injury or fatal accidents.

FUTURE SCOPE :

It is not easy to perform vehicle in reverse direction as compared forward direction. Itwill be easy to use for passengers and driver. In the parking areas the reverse breaking system should be useful. In this project, there is a great scope to modify it in different ways like providing extra sensors to reduce parking problem or blocking of wheels. Also we should increase or decrease the range of sensor by using different type ofsensor.

REFERENCES :

[1]. Fletcher, I; Arden, B.J.B.; Cox, C.S., "Automatic braking system control," Intelligent Control. 2003 IEEE Internationalymposium
[2]. http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=1254670&isnumber=28053
[3]. Wada, T.; Hiraoka, S.; Tsutsumi, S.; Doi, S., "Effect of activation timing of automatic braking system on driver behaviors," SICE Annual Conference 2010, Proceedings of vol., no., pp.1366,1369.
[4]. pp.4/1,4/6,http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=243257&isnumber=6256.
[5]. T.K. Bera, K. Bhattacharya, A.K. Samantaray: Evaluation of antilock braking system with an integrated model of full vehicle system dynamicswww.elsevier.com/locate/simpat