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Intelligent Braking System

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Abstract: *Automotive vehicles are increasingly being equipped with collision avoidance and warning systems for predicting the potential collision with an external object, such as another vehicle or a pedestrian. The number of vehicles is increasing day by day. Nowadays, accidents are increasing and are uncertain. Accidents will occur every time and everywhere and cause the worst damage, serious injury, and even death. These accidents are mostly caused by the delay of the driver to hit the brake. This project is designed to develop a new system that can solve this problem where drivers may not brake manually but the vehicles can stop automatically by detecting obstacles.*

Nowadays, technology has got vast changes which lead to an increase in the speed of modern vehicles. Speed plays a vital role to maintain time for longer distances. But, this speed also becomes a major problem and causes road accidents. Common braking is not sufficient for the avoidance of accidents when the driver is not active. Further improvement has to do with the braking system to brake a vehicle when the driver is not able to brake i.e., it may need an automatic braking system.

This automatic braking system allows the vehicle to brake without the support of the driver. The main target of the ultrasonic braking system is that the vehicles should automatically brake when the sensors sense the obstacle. This is a technology for automobiles to sense an imminent forward collision with another vehicle or an obstacle and to brake the vehicle accordingly which is done by the braking circuit.

Keywords: *Collision avoidance, Delay in braking, Automatic braking system, Sensors.*

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I. INTRODUCTION

Road accidents are the most unwanted thing that can happen to a person commuting on road. There has been a dramatic increase in road accidents across the globe. In India, road crashes occur every day and many people die due to that.

Even after the ABS system, there is a need for a smart braking system that can reduce collisions and which is able to avoid them by applying brakes automatically.

In this project, we have focused on the same system for the front of automobiles with some improvements and different supply systems. Many cars having smart braking systems are electronically actuated but here in this project, we have used the pneumatic braking system air will be used to make the brake work.

With the advancement of new braking systems and new brakes coming into the market, fatal accidents are avoided to a great extent but only until the driver is concentrated and is in full control of making decisions during the time of danger.

The number of vehicles is increasing day by day. Proportionally, the number of accidents is also increasing. 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 rearview camera systems, road-to-vehicle, and inter-vehicle communication systems, auto-parking systems,s, and new car technology for intelligent cars such as intelligent transport systems, hybrid cars, electric cars, and hydrogen-fuelled cars.

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 contribute to the technology of the upcoming automobile. To develop safety, when the 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 the response time taken by the driver plus the time required by the braking system to brake the car and the time of response of the driver is much of a greater influence. Hence, it is required to make an automatic braking system.

A problem that is often concerned the driver is the areas that cannot be seen by the side view and rearview mirrors, which is called as blind spot region of the vehicle. Vehicles in the adjacent lanes of the road may fall into these blind spots, and a driver may be unable to see the adjacent vehicles 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 the driver's inability to monitor the blind spot region well. The main objective of this project is that the car can automatically brake when driving in front & reverse due to obstacles when the sensor senses the obstacle. 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.

With this new addition of the automated system, many problems of accidents or damage can be avoided under the negligence of drivers.

II. FEASIBILITY STUDY

Feasibility is the measurement determining how beneficial the development of an information system will be to where it is applied. The feasibility analysis is categorized under main four different types:

- Operational Feasibility
- Technical Feasibility
- Schedule Feasibility
- Economic Feasibility

Operational Feasibility:

The System is to be developed for any user who wants to use it. The system that we are making will be easy to use. There will not be many complications thus even if an aged person is driving the car, they can easily operate the system.

Technical Feasibility:

It is a partial measurement of specific technical solutions and the availability of technical resorts and expertise. The components we have used are effective and give proper outcomes as designed. The components and the software we have used are known and any error solving can be done quickly in time of emergency.

Schedule Feasibility:

Schedule feasibility corresponds to whether sufficient time is available or not to complete the project.

Factors considered:

- Schedule of the project
- Time by which project must be completed
- Reporting period
- Time to buy and search for raw materials
- Designing and fabrication of the system
- Buffer time period if anything goes wrong

Economic feasibility:

Economic feasibility is a measure of cost-effectiveness. And this form of a project or solution. For declaring that the system is economically feasible, the benefits from the project should exceed or at least equal to the cost of development.

As the automobile is of a high price giving all the facilities and features, adding a new system of much higher price is not sustainable for the market and increases the overall market price of the vehicle. Thus the system is created at the least cost possible along with the required satisfaction of effective working of the system.

III. SYSTEM DESIGN AND METHODOLOGY

An intelligent brake assist system is compiled with an Ultrasonic sensor circuit that operates a pneumatic braking system. The main target for this project is, that cars can brake automatically when the sensor senses the obstacles. The braking circuit function is to brake the car automatically after receiving the signal from the sensor. This main concern is of replacement of human effort with mechanical braking. So it can be the best

safety feature for the vehicles. The pneumatically operated braking system stops the vehicle very fast and the system is fully automated.

IV. LOGISTICAL REQUIREMENTS

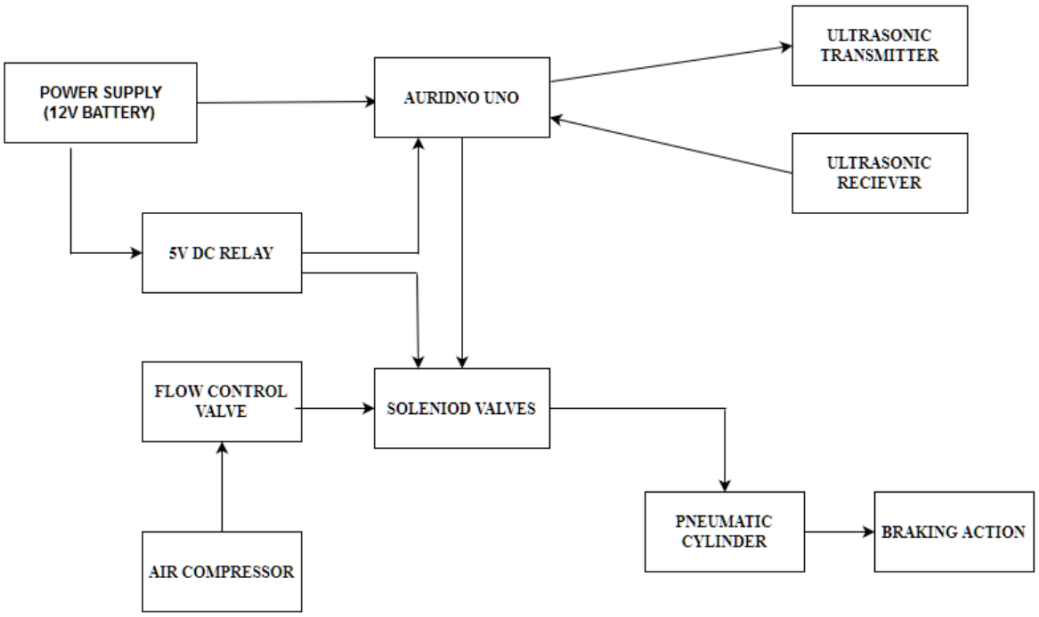
- 3D CAD Modelling Designing Software (Solidworks)
- Programming Software for Arduino
- Cast Iron and Stainless Steel for Structure
- Tires
- Bearings
- Various Nuts and Bolts
- Sheet metal
- Electronic Components (Battery, Motor, Arduino UNO R3, Ultrasonic Sensor, Relay, Wires)
- Braking System (Pneumatic Cylinder, Drum Brakes, Solenoid Valve, Compressor).

V. METHODOLOGY

This system is mainly divided into two categories according to operation.

Electronic Operation:
For the detection of obstacles in front as well as behind the car, the Ultrasonic sensor transmitter and receiver circuit are required. The output from this circuit is sent to the solenoid valve which helps in pneumatic braking.

Mechanical Operation:
When the Ultrasonic sensor gives input to the solenoid valve then the pneumatic brake is applied to the car. For this operation, the pneumatic air force is used to deaccelerate the vehicle.



The above block diagram shows the main components of the intelligent brake assist system. There are two types of power supply that are required viz. electric supply for the operation of Arduino Uno and ultrasonic sensor, and the airpower supply to operate the pneumatic cylinder. When the vehicle is in the gear, the power supply is given to the sensor unit. An ultrasonic sensor consists of a transmitter and receiver. The transmitter transmits ultrasonic waves continuously.

When a car gets too close to an obstacle, the ultrasonic waves reflect back which is then received by the receiver. After receiving the reflected signal, it gives the impulse to the control unit.

Ultrasonic sensors generate high-frequency sound waves and evaluate the echo which is received back by the sensor, measuring the time interval between sending the signal and receiving the echo to determine the distance to an object.

This reflected echo is received by the Arduino Uno. If there is no obstacle in a path, the circuit will not receive any signal and the whole signal remain as it is. The ultrasonic sensor receives the reflected echo, giving the control signal to the circuit. This control unit makes ON the solenoid valve.

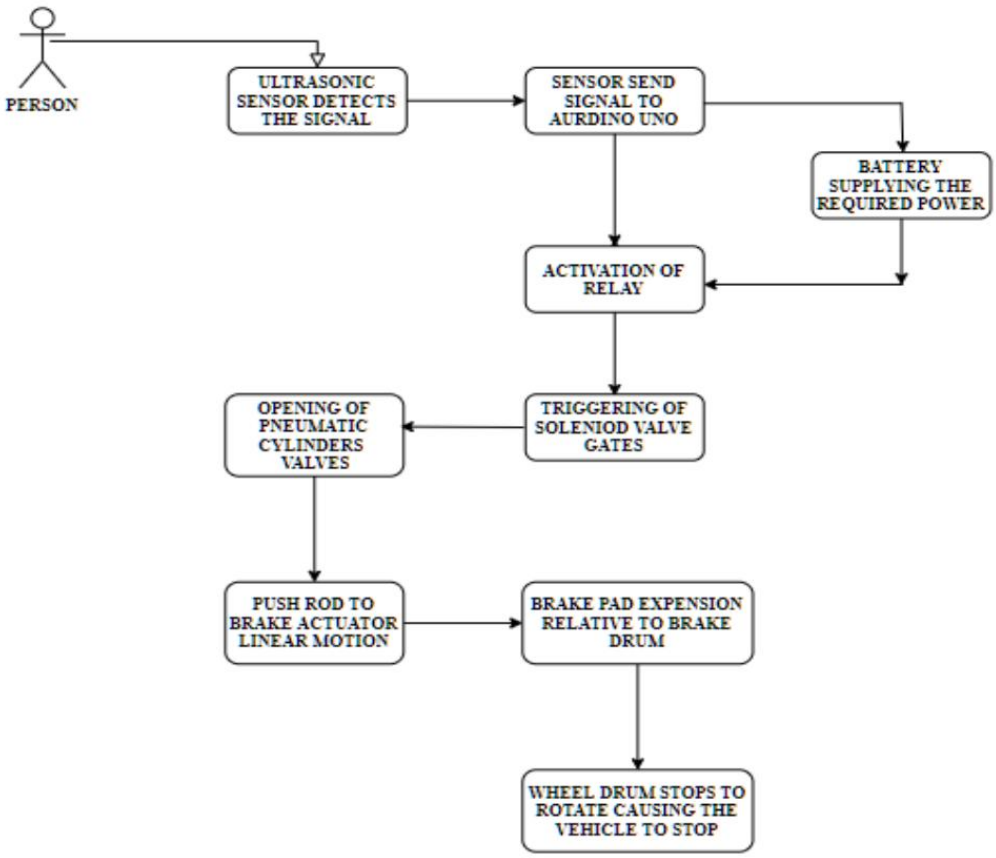
These complete processes are electronic-based which requires an electric supply. When the solenoid valve is activated, the compressed air passes to the Single-Acting Pneumatic Cylinder. A continuous supply of air through an air compressor is supplied to the solenoid valve.

The air is compressed in an air compressor and from the compressor plant, the flow medium is transmitted to the pneumatic cylinder through a well-laid pipeline system. To maintain optimum efficiency of the pneumatic system, it is of vital importance that the pressure drop between generation and consumption of compressed air is well kept.

VI. ACTIVITY AND SEQUENCE

An activity diagram is a behavioral diagram i.e. it depicts the behavior of a system. An activity diagram portrays the control flow from a start point to a finish point showing the various decision paths that exist while the activity is being executed.

A sequence diagram shows object interactions arranged in a time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario.



VII. FUTURE SCOPE

With less modification to the existing system of automobiles and under limited expense this newly designed system can be installed in vehicles and safety can be assured to a great extent. Our only objective is to create a small system for braking using a pneumatic brake which will be electronically actuated on the signals of the sensor.

In this project, a braking system is developed such that when it is active it can apply brake depending upon the distance of the object sensed by the ultrasonic sensor. Vehicles are often equipped with active safety systems to reduce the risk of accidents, by developing this active safety system many fatal accidents or even minor ones due to carelessness that occur in the urban environments can be brought under control.

VIII. OUTCOMES

Merits:

- Discrete distances to moving objects can be detected and measured.
- Resistance to external disturbances such as vibration, infrared radiation, ambient noise, and EMI (Electromagnetic Interference) radiation.
- Measures and detects distances to moving objects. Impervious to target materials, surface, and color.
- Solid-state units have virtually unlimited, maintenance-free lifespan.
- Detects small objects over long operating distances.
- Ultrasonic sensors are not affected by dust, dirt, or high moisture environments.

Demerits:

IX. The frequency of the ultrasonic sensor is limited.
X. The System requires the use of compressed air due to that it reduces the engine power up to some amount.
XI. The braking efficiency can vary according to the various phenomenon as temperature, road conditions, etc.

XII. CONCLUSION

Intelligent braking is one of the smart options which can be implemented in various applications for stopping a moving body very efficiently.

The Braking system, if implemented can reduce the number of accidents and can save invaluable human lives and property. The whole system is wide open and can work with various setups.

REFERENCES

[1]. Hemalatha B. K., Pooja, Chaithra M., Megha S., Rakshitha R. T. "Automatic Braking System for Automobiles Using IR Sensor" International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 5, Issue 5, May 2016.
[2]. Dhanya K. R. R. Jeyanthi "Automatic braking system with sensor fusion concept" IEES 4(1) June 2012
[3]. Lennon, W.K., and. Passino, K.M . " Ieee Transaction On Control System Technology", VOL.7, NO.2, 1999
[4]. www.sciencedirect.com/engg./automobile/brakingsystem/microcontrollerbraking
[5]. www.ijetae.com /publish/201352/, VOL.3, ISSUE 4, APRIL 2013
[6]. SAE Brake handbook of brake, February 1997
[7]. Ravi Ingle, Sumit Thak, Ankush Shelke."Automated reverse braking system" International Journal Of Engineering Sciences & Research Technology,3(4): April 2014 ISSN: 2277-9665
[8]. Dr. P. Poongodi. Mr. P. Dineshkumar, "Automatic Safety System For Automobiles"
[9]. Kellar. C.G. Univ. of Heidelberg, Heidelberg, German, Active Pedestrian Safety by Automatic Braking