International Journal of Research in Advent Technology, Special Issue, December 2018
International Conference on Mechanical and Civil Engineering (ICOMACE-2018)
E-ISSN: 2321-9637
Available online at www.ijrat.org

Investigation in Intelligent braking system

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Abstract- In day to day life, road accidents are common everywhere. Accident prevention is one of the challenge for researchers. Braking failure of the vehicles is the one the major factor for vehicle accidents. So a braking system is an important component in any vehicle. It helps to slow down the vehicle or stop the vehicle by reducing the kinetic energy. This paper aims is to design and develop a control system for anti-lock braking system for a vehicle model. This Braking system is 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 break the system. The vehicle model is tested against stationary body, moving body etc. The outcome of the research will be useful in the field of vehicle braking system.

Keywords- IR sensor, Micro controller, Intelligent Braking System, ABS, Pneumatic system.

1.INTRODUCTION

The braking system is a very important component for a Vehicle. It is used to reduce the speed of the vehicle or to stop a vehicle. It also helps the driver and passenger to be safe[5].

Present day braking system allows the driver brake manually at the same time it also controls the brake to reduce risk factor in panic situation (Kavathar 2014).

For driver's safety, the vehicles are provided with antilog braking system (ABS), traction control and brake assists in India. The main function of ABS to regulate the wheel slip and helps vehicle safety. Also intelligent braking system was adopted by adopting several sensors to respond when emergency conditions occur (Deotlae 2000& Perez 2009).

In developed countries, the intelligent braking system has received ample of attention and a lot of applications like smart vehicle and smart highway etc. For smart vehicle maneuverer, the intelligent braking system should couple with automatic traction control system, intelligent throttle system auto cruise system(Sidek,2010).

2. MATERIALS AND METHODS

An infrared sensor is an electronic instrument which is used to sense the distance of the object or obstacle in front the vehicle by emitting and receiving the light rays. The infrared sensor is controlled by Microcontroller.Microcontroller is a processor with built in memory and RAM. It controls the RAM, ROM and peripheral chips. A direction control valve is used to control the directionof airflow for applying the brake. An AC motor is an electric motor driven by an alternating current (AC). It is used to operate the valve.Pneumatic cylinder is a mechanical device which use the power of compressed gas to produce a force for the braking sytem.

The infrared sensor is placed at the front of the vehicle model. If any obstacle is present in a path, the Infra-Red rays get reflected. This reflected Infra-Red rays are received by the infra-red (IR) receiver. The IR receiver circuit receives the reflected IR rays and giving the control signal to the control circuit. The control circuit is used to activate the solenoid valve. If the solenoid valve is activated, the compressed air passes to the Double Acting Pneumatic Cylinder. The compressed air activates the pneumatic cylinder and moves the piston rod. If the piston moves forward, then the breaking arrangement activated. The braking arrangement is used to apply brake the wheel gradually or suddenly due to the piston movement. The breaking speed is varied by adjusting the flow control valve provided.

3.WORKING

The IR transmitter circuit is to transmit the infra-red rays. if anyobstacle is there in a path, the infra-red rays reflected. this reflected infra-red rays are received by the receiver circuit is called "ir receiver". the ir receiver circuit receives the reflected IR rays and giving the control signal to the control circuit. The control circuit is used to activate the solenoid valve. The operating principle of solenoid valve is already explained in the above chapter. If the solenoid valve is activated, the compressed air passes to the Double

Acting Pneumatic Cylinder. The compressed air activate the pneumatic cylinder and moves the piston rod. If the piston moves forward, then the breaking arrangement activated. The breaking arrangement is used to break the wheel gradually or suddenly due to the piston movement. The breaking speed is varied by adjusting the valve is called "FLOW CONTROL VALVE". The compressed air flow through the Polyurethane tube to the flow control valve. The flow control valve is connected to the solenoid valve as mentioned in the block diagram. The air tank contains the compressed air already filled. The switch was ON at the time of emergency, the solenoid valve was activated. The solenoid valve stem is open, the compressed air flow from the air tank to the flow control valve. The compressed air flow is controlled by the valve is called "FLOW CONTROL VALVE". This air flow is already set. Then the compressed air goes to the pneumatic cylinder. The pneumatic cylinder piston moves forward at the time of compressed air inlet to the cylinder. The pneumatic cylinder moves towards the braking arrangement. Then the braking liver is activated, so that the vehicle stops. Then the pneumatic cylinder piston moves backward. The brake pedal or Bush Button was activated at the time of any braking time. The Electrical Signal is given to the solenoid valve, when the pedal/Bush Button is activated. The compressed air is goes to the solenoid valve. The solenoid valve is simultaneously activated at the time of pedal/Button pushed. The compressed air goes to the pneumatic cylinder. The compressed air pusses the pneumatic cylinder piston and move forward. The braking operation occurred at the solenoid valve activated time. This activation of solenoid valve is continuous process and a constant and smooth so that the smooth braking operation is done. Another solenoid valve is deactivated at the time of pedal releasing time. The inside of the pneumatic cylinder air goes to the solenoid valve with the help of exhaust port

4.EXPERIMENT

The tests were carried out at two different obstacles namely stationary and moving obstacle. Each obstacle were conducted at two different surface namely dry and wet surface. The surface considered is a cement surface.We tested the vehicle on different surfaces (i.e. Dry and Wet surfaces) withdifferent obstacles.

5. RESULT AND DISCUSSION

In the case of stationary object, the braking distance is increased for wet surface when compared to dry surface also the braking time more for wet surface when compare to dry surface.

5.CONCLUSION

An attempt was made to do research on Intelligent braking system.The vehicle model was developed. The vehicle model was tested on both dry and wet surface.It was found that with half a second,the vehicle model has stopped in infront of the obstacles.In future comparision will be done between the normal braking vehicle and intelligent braking.

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List of Figures

Figure 1.Arrangement of wheels and brake

Figure 2.Motor fixed to frame

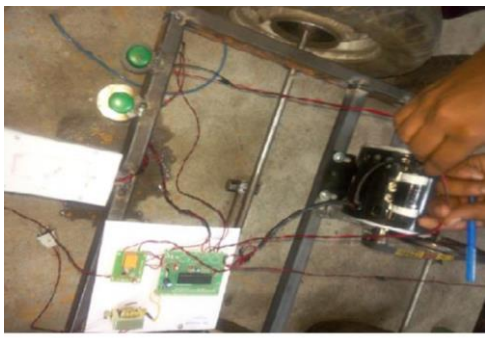

Figure 3.Electrical connections

Figure 4.Assembled vehicle model

Fig.5 Braking of the vehicle model in front of stationary model

Fig.6 Braking of the vehicle model in front of moving model

List of Tables

Table 1 Braking distance and braking time

Case	Name of the Surface	Braking Distance (cm)	Braking Time (Sec)
Case1	Dry	0.087	0.47
	Wet	0.093	0.57
Case2	Dry	0.91	0.45
	Wet	0.94	0.53