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Intelligent Braking System

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Abstract— Now day number of road accidents have increased to an unacceptable rate thereby causing damage to life and property. The reasons for road accidents are either driver error or operational failure of the vehicle. But several collision avoidance systems have been introduced to prevent such mishaps and this paper is about one of such system called 'intelligent braking system'. Intelligent braking system consists of an infra-red transmitter and a receiver which helps detect the distance between the vehicle and the obstacle. Then a microcontroller receives the signal from the sensor to apply brakes which are pneumatically actuated without any aid from the driver, and hence increases passenger safety.

Index Terms: **infra-red sensor, IR Receiver, Microcontroller, pneumatic braking system etc.**

1 INTRODUCTION

THE breaking system is one of the most critical part in the vehicle with the number of vehicles increasing on road, the number of traffic accident also increasing traffic safety research indicates that only about 40 per cent of drivers involved in a crash applied the brakes. The majority do not even get their foot on the brake pedal, failing to identify the situation in time to take evasive action due to distraction or by looking somewhere else. While passive safety devices like seat belts and airbags help reduce the injuries after the accident has occurred the new type of active safety system is intelligent breaking system which makes the vehicle to stop completely or slows it down if the driver does not act to the object in-front of the vehicle.

This is achieved by infra-red sensor which will detect the obstacle or vehicles in the path this is achieved by infrared wave emitter and receiver this will give the distance between the obstacle and the vehicle then microprocessor in the system will give command to activate the brake and it will slow down the vehicle or stop it if necessary [1].

2 METHODOLOGY

The intelligent breaking system consists of IR wave emitter and receiver to detect the obstacle and its distance in the path of the vehicle. The reflected wave will give the pulse which will give the distance between the obstacle and the vehicle. the breaking of the vehicle is related a what speed the vehicle is travelling and the distance between the obstacle and the vehicle.

- Development of an idea.
- Study of literature.
- System survey and draw backs.
- Cost estimation and standard parts.
- Calculations required.
- Experimentation.
- Result and discussion .

3 BASIC COMPONENTS

3.1 IR Sensor

An object can be detected by IR system consisting of an IR transmitter and IR receiver that sends out IR energy and looks for reflected IR energy to detect presence of any obstacle in front of the sensor [2]. An IR sensor consists of an IR LED and an IR photodiode together they are called as opto-coupler. IR transmitter is a light emitting diode (LED) which emits IR radiations. The IR rays are invisible to the naked eye. IR receiver which detects the radiation from the IR transmitter. The IR receiver come in the form of photo diodes and phototransistors. IR photodiodes are different from normal photo diode as they are different from the normal photo diodes as they detect only IR radiation based on the intensity of the reception by the IR receiver the output of the sensor is defined.

Fig 1: IR Sensor.

3.2 Microcontroller

Audrino uno s a microcontroller board based on the ATmega328P it has 14 digital input/ output pins (of which 6 can be used as PWM outputs), 6 analogue inputs, 16 MHz quartz crystal ,32 kb flash memory, 2kb SAM, 1kb EEPROM, a usb connection, power jack, an ICSP header and a reset button. This can operate on external supply of 6 to 20 volts but the recommended range is 7 to 12 volts. The programming of the microcontroller is done by simplified form of c++ language.

Fig.2: audrino uno.

3.3 Power supply, control unit and Wiper motor

Electric power is needed to run controlling systems, IR sensor and motor. Voltage of 24v DC supply is taken from the battery (In cars the existing battery can be connected).

Here wiper motor is used to run the model which receives the low current then convert it into high current signal to run the motor.

Fig. 3: Wiper Motor.

3.4 Solenoid valve

Solenoid valve is a electromechanically operated valve. It is controlled by an electric current through a solenoid in the case of 3-way valve has 3 ports it connects one port to either of the two other ports here it has ¼ inch port size , 220 v AC type, 16mm2 nominal area.

Fig. 4: Solenoid Valve.

3.5 Pneumatic cylinder

To actuate the breaks pneumatics are used compressed air enters into one end of the piston and hence imparts force on the piston and the piston becomes displaced in double acting cylinder air will move both extends and retracts the strokes they have two ports to allow air to flow one for outstroke and one for instroke which will initiate the breaking and releasing.

Fig. 5: Pneumatic Cylinder.

4 WORKING

The intelligent braking system is working by using IR sensor to detect the obstacle and with pneumatic braking to stop the vehicle.

4.1 Observations

- When obstacle is not in front of the vehicle in the proximity zone the output of the sensor remains the same and the vehicle moving.
- When the obstacle is detected by the sensor in the proximity zone by the IR sensor the microcontroller checks the signal and actuates the brakes and the vehicle will stop.

TABLE I
BASIC COMPONENT LIST

Sl.No.	Part Name	Material/specification
1	Frame	Mild Steel
2	Shaft Dia	20mm, MS
3	DC Motor	12 v
4	IR Sensor	STD
5	Pneumatic Cylinder	MAL16x100 (double acting)
6	Solenoid Valve	5/3 STD
7	Chain Drive	STD

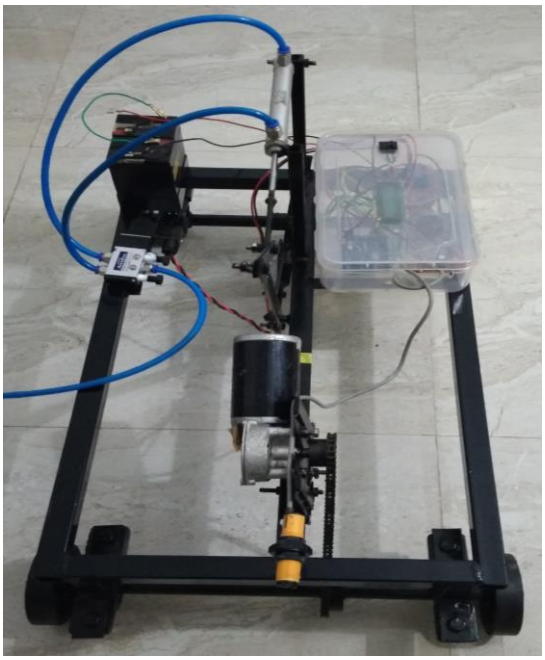

Fig. 6: Concept Model.

5 APPLICATION, ADVANTAGES AND DISADVANTAGES

5.1 Application

- This system can be used in vehicles like cars, trucks etc.
- Automated guided vehicles in industries.
- Avoid accidents during manufacturing in production [4].

5.2 Advantages

- Simple in construction.
- It provides safety to the passengers and also to the vehicle body.
- It reduces accidents intensity and impact.
- It increases the response time of the vehicle by braking and keeping the passengers and vehicle intact[3].

5.3 Disadvantages

- IR sensor range is small.
- Sensors may sense obstacle due to presence of dirt[3].

6 CONCLUSION

Transportation is one of the basic need now a day with increasing number of vehicles accidents are also increasing so, we have proposed intelligent braking system which eliminates the accidents and reduce the severity of it when occurred. In the present work of ours the prototype is bases on IR sensor which is used to detect the obstacle with the distance which is at relatively to the speed of the vehicle and the vehicle is stopped by pneumatic brakes. The approach we present are at preliminary stage it needs further research to improve it. To sense the driver is awake or watching somewhere else. To detect the false nearby obstacle while turning.

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