Design of Low-Speed Intelligent BrakeAssist System in Vehicle

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Abstract: I.C Engines have been advanced a lot such that its speed is becoming a major catastrophe. Advanced automatic braking system improves braking techniques in vehicles. This project is designed with ultrasonic transmitter, ultrasonic receiver and arduino UNO R3 board with PIC microcontroller, DC gear motor, Servomotor and mechanical braking arrangement. The ultrasonic sensor generates (0.020-20) KHZ frequency signal. It is transmitted through ultrasonic transmitter. The ultrasonic receiver is used to receive the reflected wave present in front of the vehicle, then the reflected waves is given to the ultrasonic wave generator unit in which the incoming wave is amplified and compared with reference signal to maintain a constant ratio and the signal is given to the microcontroller and through which the working of DC gear motor and servomotor may takes place, which results in application of brakes.

KEYWORDS: Arduinoboard, Ultrasonic, Buzzer Alarm, Digital Tube Display, Vehicle, Arduino Programming Software

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INTRODUCTION

Generally speaking, traffic accidents caused by driver error are mainly due to the driver. Such as pilot error, drunk driving, braking is not timely and other human factors are the main reasons to cause the traffic accident. In the traffic congestion on the road, because of bad weather or the driver's carelessness and many other factors, even if the car at low speeds because of before and after the two cars too close, missed the best time for a vehicle brake, lead to the

Most of the traffic accident is a small automobile collision resulted in a busy road and small friction. The accident loss although rarely, but it is also a great loss of property to the driver. Car accidents are caused by a variety of factors such as mirror blind spots, drivers to judge the distance between obstacles incorrect. Inview of the above circumstances, design anauxiliary driver activeprevention of collision vehicle low speed intelligent braking system for driver assistant safe driving is necessaryoccurrence of rear end accident

OBJECTIVES

The aim is to design and develop a control system based intelligent electronically controlled automatic braking system is called INTELLIGENT BRAKING SYSTEM (IBS). This vehicle speed is sensed by the proximity sensor and this signal is given to the control unit and braking activation system.

PRINCIPLE COMPONENTS OF INTELLIGENCE BRAKING SYSTEM

- SENSOR
- TRANSDUCER
- ULTRASONIC SENSOR
- OPERATIONAL AMPLIFIER AND ADC
- BRACKING CIRCUIT
- DC GEAR MOTOR
- SERVOMOTOR

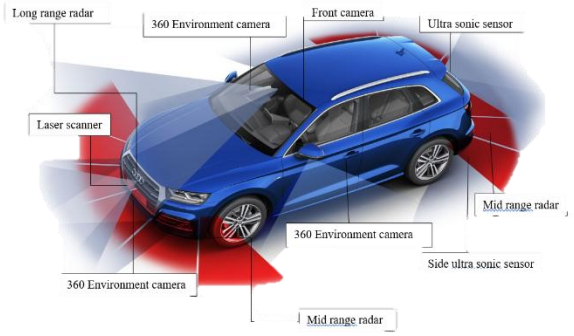

Fig1. sensors position in vehicle

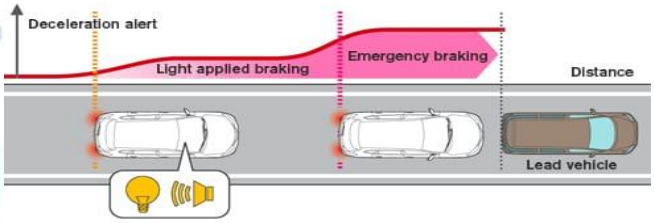

Fig.2: Reduction in speed of vehicle

THE OVERALL DESIGN SCHEME OF THE SYSTEM

This system uses AT89C51 MCU as the main controller. The system work process is as follows. The method adopted in the design of ultrasonic distance measurement to measure the distance of objects in front of the car. Firstly, the ultrasonic transmitting probe emission signal and immediate feedback and reflection when the ultrasonic scanning toobstacles. The ultrasonic receiving pro be receives the transmitted wave,ultrasonic receiving circuit to drive signals is transmitted to the single chip microcomputer.

It is only to display the distance when the obstacle is detected more than safe distance. It will start buzzer alarm if less than the safe distance. The implement agencies will be gan to work if reaching the braking distance and stepper motor drives the brake pedal. The brake pedal movement simulation to generate force to achieve automatic brake aim. The design is shown in figure1

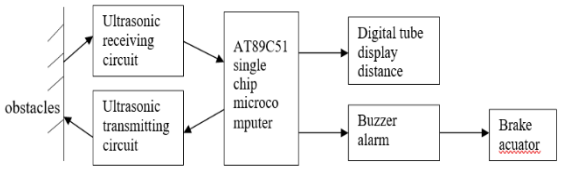

Fig.3 vehicle low speed intelligent braking system design

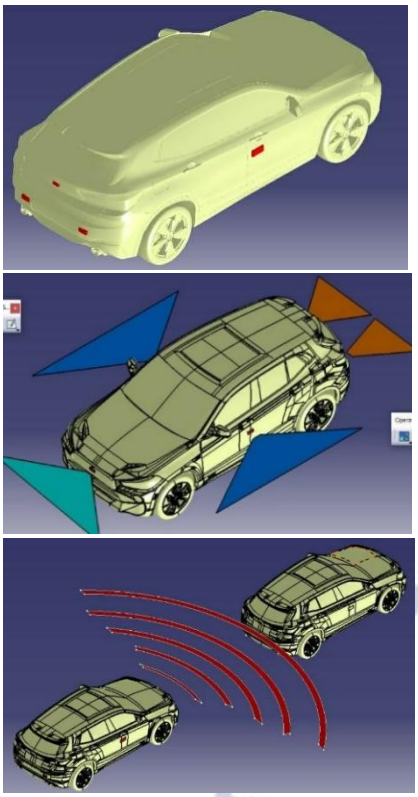

Fig 4 : Isometric modeling of a car with sensors using catia

VEHICLE BRAKING DISTANCE

The key lies in the intelligent brake are to establish reasonable and perfect alarm and safe distance braking model. In the design of this system adopted in a very short period of time, so do not consider the effect of acceleration, the vehicle before and after, as they are all uniformmotions. This is a cycle detection mode. The time to the owners of the alarm signal and the automatic brake is directly affecting the effects of collision. This whole system put forward a very high request system for data capacity and actuatoroperation single-chip processing speed. The following will be the system alarm analysis and determine the safe braking distance.

DETERMINE THE BRAKING DISTANCE

The relative speed of the vehicles V and relative distance S are the real-time measurement of parameters of ultrasonic sensor. In the differential model, assuming the front vehicle motionless, the vehicle is moving at speed. At this time, the intelligent braking system to control the step per motor to brake quickly, ignoring the brake operation time.

WARNING DISTANCE

Warning distances the distance from the buzzer alarm to the driver to depress the brake pedal brake application. There action time is the driver reaction time T1 and mechanical system T2. According to the braking distance data, the driver's reaction timeT1 refers to the driver to identify obstacles, to put the pedal to the brake pedal force experienced by the time. This period is generally 0.3 ~ 1.0s. This design selects T1=1.0s.The mechanical system reaction time is T2 to generate force applied to the brake pedal force, to produce the maximum braking deceleration time. This period is generally 0.2~ 0.9s. This design selects T2=0.5s

$$S_2 = S_1 + V\,(T_1 + T_2)$$

And μ for road adhesion coefficient.

$$S = \frac{V^2}{2g(1-\eta V)\mu}$$

It can be seen from the Table1 the vehicle speed is higher, the braking distance is longer. The carspeed is high, the braking distance. When the vehicle speed reaches 20Km·H-1, warning distance is up to 10m.

So, the system will avoid accidents by automatic braking operation when it detected possible collision threat. When the speed below15km system can realize automatic brake. When the speed more than 15 km systems can reduce the damage degree ofcollision.

CONCLUSION

This design is a new type of multifunctional automobile anti-collision warning system. It has the effect of early warning collision avoidance warning systems already on the market. The system has the function of new automatic brake. At present, the anti-collision used in the car on the car alarm system is mainly to send the reminding information. The domestic automobile factory mainly is concentrated in the surrounding environment detection, vehicle safety distance determination and alarm to warn the driver driving safety. This paper designed a car with automatic braking function of the automotive active collision avoidance system. The anti-collision system function is unchanged and increases the intelligent automobile brake functions so that the automobile anti-collision alarm system to realize multiple functions.

Anticollision in the existing system is mainly based on the measurement results throughthe sound or image to inform the driver to change down around obstacles. Therefore, this paper adds auxiliary braking device automatically. The car cannot rely on the driver automatically brake in order to achieve the purpose of safe driving. The design of the system use ultrasonic ranging on base of AT89C51 microcontroller as the core control unit.

FEAUTURE SCOPE:

The future scope is to design and develop a control system based on an automotive braking system is called —Automatic Braking System. The Automatic Braking System with ultrasonic sensor would alert the driver when the distance between vehicle and obstacle is in within the sensing range zone then the brakes are applied.

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