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Smart Braking System Using Ultrasonic Sensor and Actuator

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Abstract - *This paper describes a new smart braking system for two wheeler vehicles like motor bike, scooter etc. Road accidents are a common place in today's scenario. Now a day's no. of accidents are increases as compared to past. Accidents causes worse damage, serious injury and even death. Accidents prevention has been one of the leading areas for research. Mainly focus on prevention of accidents due to nervousness, loss of control, drunken driving, rash driving etc. Manual methods of applying brakes is always dangerous as it leads to accidents. Unconsciousness of driver, road condition, and uncontrollable speed of vehicle and manual operation of braking systems are the reason of accidents. It is necessary to control brakes automatically through electronics devices to minimize the accident problems. In this research paper, we proposed an effective methodology for automatic controlling of braking system to prevent accidents with the help of electronics engineering. The system consists or ultrasonic sensor wave emitter fitted at the front portion of the vehicles and ultrasonic receiver to receive the signal. This reflected wave gives the signal to MCU to applying brakes automatically. By using this System we can reduce no. of accidents.*

Key Words: Ultrasonic Sensor, Actuator, Automatic Braking, Ultrasonic Emitter, Microcontroller Chip, Safe Driving.

1. INTRODUCTION

The number of automobile users is increasing day by day. At the Same time, traffic congestion has become a worldwide problem. This problem is mainly due to human driving which involve reaction time delays and judgment errors that may affect traffic flow and cause accidents. Road accident is most unwanted thing that happens to road user. In Indian scenario, normally vehicles equipped with ABS (Anti-Lock Braking System), traction control, brake assists etc. for driver's safety. All these systems employ different types of sensor to monitoring the condition of the vehicle and respond in an emergency situation. This smart braking system has to be work with ABS (Anti-Lock Braking system) equipped in vehicle in order to increase vehicle stability during emergency braking. The primary objective of this paper is to develop a safety car braking system using ultrasonic sensor and to design a system with less human attention to the driving.

1.1 Smart Braking System

Smart braking system is designed for preventing lots of accidents. It operates automatically not manually so chances of failure of this system is less due to this the chances of accidents is also reduces. It is a combination of electronics and mechanical engineering. It is a electro-mechanical device which is designed to prevent accidents and loss of human lives. This system contains Ultrasonic sensor, Relay switch, Micro Controller Unit, Actuator and brakes.

Some previous research paper helps to me to design this system. We use ultrasonic sensor instead of IR sensor because range of IR sensor is 1m, and it can be affected by sunrays.

S.N. Sidek Intelligent Braking System (2010) has a lot of potential applications especially in developed countries where research on smart vehicle and smart highway are receiving ample attention. The system when integrated with other subsystem like traction control system, intelligent throttle system, etc. will result in smart vehicle. The driver at the end of the day will become a passenger, safety accorded the highest priority and journey will be optimized in term of time, duration, cost, efficiency and comfort ability.

G.L. Gissinger (2002) describes a new Intelligent Braking system for motor vehicles. A mechatronic approach helped to avoid some drawbacks found in conventional system. The Brake was designed according to the "full contact disc brake" principle. Indeed to provide better control, the regulator uses feedback information not only from slip, but also from the braking torque.

1.2 Sensor

A sensor is an electrical device that maps an environmental attribute to a quantitative measurement. Each sensor is based on transduction principle which is conversion of energy from one form to another form. There are two important terms related to any sensor – • Target Angle – This term refers to the tilt response 'limitations of a given sensor. Since the ultrasonic waves reflect off the target object, target angles indicate acceptable amounts of tilt for a given sensor. • Beam Spread – This term refers to the

maximum angular spread of the ultrasonic waves as they leave the transducer.

2. OPERATIONAL PROCEDURE

Procedure of performing the operation of this system is as follows:-

In this system, we are using ultrasonic sensor which have range .2m to 4m. This sensor is fitted over the front portion of the body which emits waves to analyses the speed motion of the vehicle and distance of obstacle (vehicle) in front of them. These sensors give real time inputs to the microcontroller coding. Hall sensor will be used in the system to analyses the speed of the vehicle with the micro controller. Here relay switch are included to activate the actuator to pull drag wire to operate brakes. Relay switch are electro-mechanical switch which operates when electric current passes through them. Electric current passes due to sensors. When sensor senses the obstacle send the signal to MCU Unit it sends current to Switch on the Switch. When relay Switch is ON then actuator is activated. Overall this system operates automatically.

Aware of safety in terms of avoiding accidents like in the first place and then protecting occupants when a crash is unavoidable, we can avoid more accidents, save more lives, and reduce insurance and medical costs to society by implementing this system. This system is also necessary implemented like wearing seat belts, helmets etc., in vehicle by government authority to reduce lots of accidents.

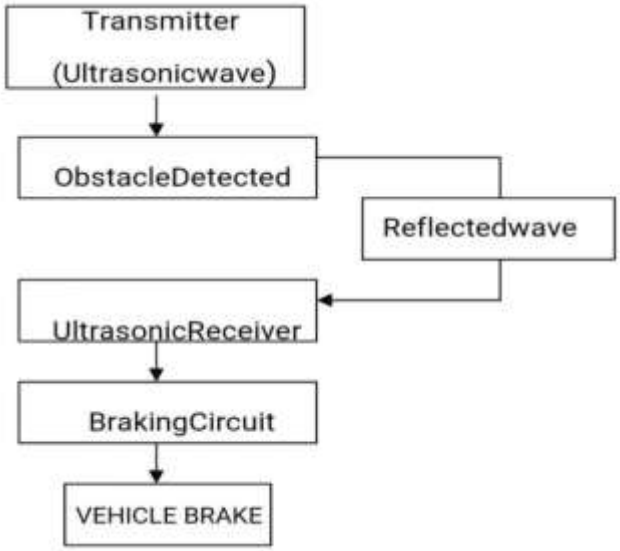

Fig-1. Ultrasonic Emitter and Receiver Mounted on Motor Bike

Fig-2. Picture of Smart Braking System Project

3. DEFINE A PROBLEM

1.1 Problem Identification

The initial requirement for a project work is to identify and understand the nature of the problem. The problem is related to the installment of braking system. Braking system tools and equipment‘s play a vital role in making and installation of the system on the vehicle. The main target of the ultrasonic braking system is that, 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.

3. CONCLUSION

The Braking system, if implemented can reduce number of accidents and can save invaluable human lives and property. The whole system is widely open and can work with various brakes, various sensors and actuator solutions. It must be mentioned that the different subsystem such as sensors, actuators etc. have found other applications since they were designed. Now, this system is designed as a project work at small level but we can adopted this system at industry level so that we can prevent lots of accidents and human lives. The future of automotive safety is more than just developing new technology for preventing accidents.

4. FUTURE 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. This is the new function in this prototype design that could be possibly used for all the vehicles. By making it safer, this system will provide better guarantee for vehicle‘s safety and avoid losses. Therefore, the safety system of vehicles will be developed and may have more market demands. It can be further used for large type of heavy vehicles like buses, trucks, cranes, tractors, etc. We can surely get the information about the obstacle detection sense zone according to vehicle condition. It is verily useful to public sector and users. It is also avoids the accidents in large or metropolitan cities. So we feel it is a better idea for automatically braking of vehicle with moderate cost.

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