Active Safety Braking System

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Abstract: Now a day's accidents are increasing more and more, so safety has acquired a priority. Improper usage of brakes is also one of the problems for accident. The project idea is to improve the safety parameters regarding to brakes. Sudden recognition of any object in front panics the driver, at that situation normal drivers fail to use brakes correctly this leads accident, taking the driver reaction time into account we will try to assist the driver by doing this we can avoid accidents and hence can increase safety.

Index Terms: Brakes, Safety, Time.

I. Introduction

Brakes are used to inhibit the motion in order to prevent the collisions. Generally During emergency situations, whenever drivers see an object in front suddenly, they get panicked and fail to apply brakes completely. For normal drivers the reaction time to press the brake pedal is high but the force applied is insufficient, hence they may fail to use the full braking efficiency of the car which leads to accident.

Active safety braking system will help in emergency conditions by increasing braking force. The speed with which driver presses the brake pedal in normal conditions is different with speed in emergency conditions. Drivers press the brake pedal quickly during emergency situations. By analysing the speed
With which brake pedal is pressed active safety system will detect the emergency condition and applies full braking force even though diver did not press the brake fully. This active safety system has to be used with ABS and ESP equipped cars in order to increase the control of the car while emergency braking.

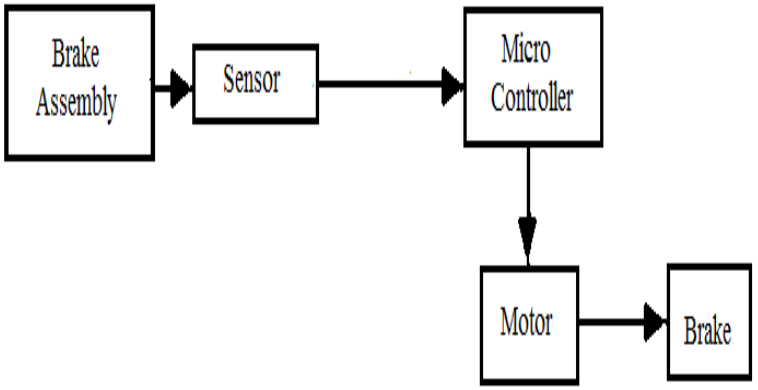
II. Literature Review

Studies from various road safety surveys have stated that normal drivers fail to apply brakes completely during emergency condition. The main reason is that the stopping distance depends on the deceleration when we apply brakes, due to insufficient braking force applied the stopping distance is more and hence this leads the vehicle to crash due to collision with the obstacle.

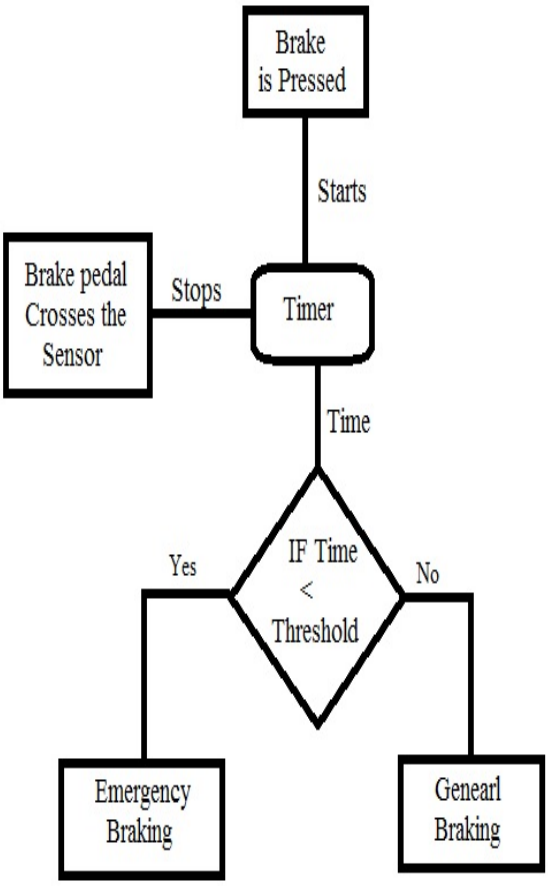
The work began with the method to detect the problem by considering the reaction time, hence to detect the driver intention to apply full brake, trails are made to consider the time taken for the brake pedal to move some amount of distance and hence fix some threshold time to detect the emergency.

III. Proposed Methodology

System has been designed with the required algorithm in order to detect and differentiate the normal and emergency situation. Active safety system interprets a quick push of brake pedal as emergency condition. The components in active safety systems are brake pedal, optical sensor, micro controller, motor and brake.



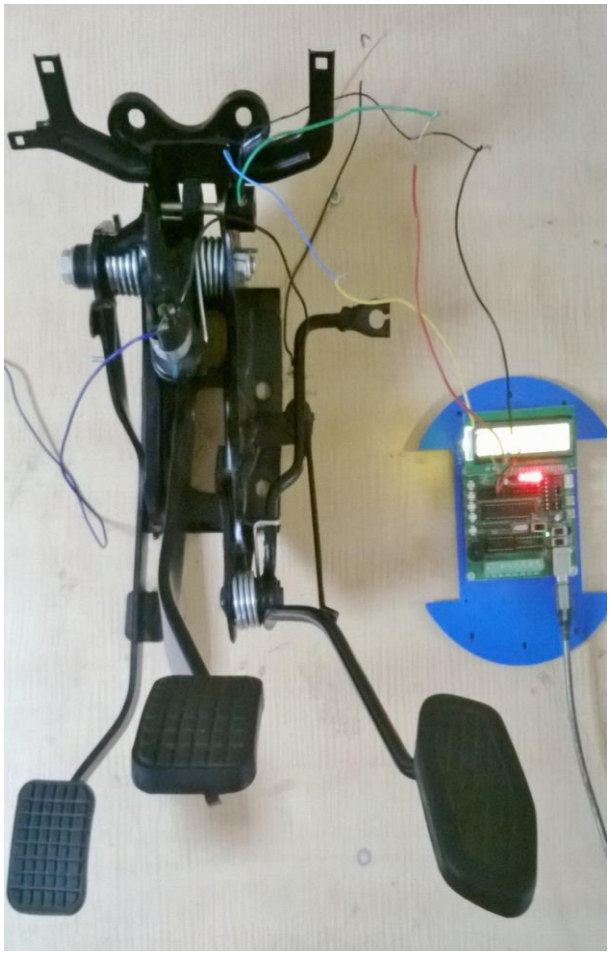
Brake pedal will give analog output voltage when brake is pressed. This voltage value is given as input to the micro controller. Optical sensor is used to detect the speed with which brake pedal is pressed. Optical sensor is placed at 70% of brake pedal path. Optical sensor gives analog value which has to be converted into digital value for analysing. Optical sensor values are given as input to micro controller.
Micro controller will take two inputs one is from brake pedal another is from optical sensor. Output from brake pedal will determine whether brake pedal is pressed or not. Optical sensor will give output voltage whenever brake pedal crosses it. When brake pedal is pressed a timer is switched on. Timer is switched off whenever brake pedal is released. Time between the brake pedal pressed and brake pedal crossing the optical sensor is given by the timer. This timer value is compared with threshold value. Whenever the timer value is less than threshold value the system declares it as emergency condition and motor is actuated to increase the braking force.



We can increase the brake force by pulling diaphragm of vacuum booster in emergency conditions, or by pulling hand brake. Hand brake is usually used to keep the vehicle motionless in parking or inclined places. The motor pulls the hand brake cable for few seconds in emergency condition to increase braking force.

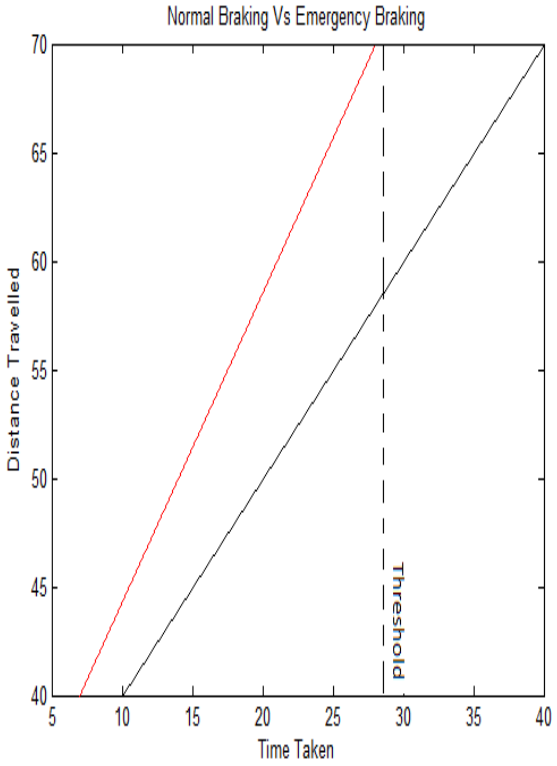
Now a day's most of the vehicles have hydraulic braking system which is more efficient system than mechanical braking system. Hydraulic braking system mainly consists of brake pedal, master cylinder and vacuum servo. Vacuum servo will assist the driver by increasing the braking force thus reducing the braking effort. Vacuum servo multiplies the brake force applied by the driver. It consists of rubber diaphragm in centre dividing it into two chambers. One chamber is low pressure (vacuum) chamber and is connected to engine intake manifold. Other chamber is filled with atmospheric air when brake is pressed which has high pressure than vacuum. Due to this pressure difference diaphragm will move forward and creates force on brake fluid. According to the braking diaphragm will move further and thus fluid will move. When brake is pressed fully the diaphragm will move fully in forward direction thus multiplying braking effort.

Active safety braking system will increase the braking force in emergency situations by pulling the diaphragm by using motor. This method of increasing braking force is more efficient than hand brake principle.



IV. Results

From the graph, results obtained clearly differentiate the normal and emergency conditions, a shown in graph, we can clearly observe the time taken by brake pedal to reach the 70% of its position is much less in emergency condition than the normal condition.



Conclusion

Finally we conclude that one can reduce the stopping distance by implementing the active safety braking system and hence accidents or decreased.

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