CHAPTER 6

CONCLUSION AND FUTURE WORK

6.1 CONCLUSION

Active systems for vehicle safety control has been investigated by many researchers and developed by the automobile manufacturers. In the active vehicle control family, several technologies have found their way into production commercial vehicles, such as Antilock Brake System (ABS), Traction Control System (TCS), and Vehicle Stability Control (VSC). The ABS system is designed to prevent vehicle wheel skidding during braking, whereas the TCS system is to prevent vehicle wheel skidding during acceleration. VSC is a technology of applying electronic control to vehicles. It was developed to improve the vehicle safety by preventing vehicles from spinning and drifting out with proper control system design. It is also referred to as yaw stability control system or electronic stability control systems.

Antilock Brake System (ABS) proposed in this work can be classified under the category of VSC technology. In other words, the ABS is about skid preventing due to sudden road surface change, while the VSC is about maintaining the vehicle stability during cornering. When a vehicle is cornering without proper control, the road surface condition may affect the vehicle trajectory. If the road surface’s tire friction coefficient suddenly becomes very small, the driving wheels will slip and the vehicle will likely skid. Under this circumstance, there are several ways to control the vehicle’s yaw motion. They are such as differential braking systems, and steer-by-wire
systems, etc. The differential braking systems utilize the ABS brake system on the vehicle to apply differential braking between the left and right wheels to control yaw rate, while the steer-by-wire systems track the driver’s steering angle input by adding an assistant steering angle to the wheels.

Some vehicle stability control methods based on the slip ratio estimation have been developed. Fujimoto, Fuji, and Takahashi (2007) proposed a method for estimating the slip ratio so as to control the vehicle by properly distributing the torque based on wheel’s slip ratio. The drawback of this method is the necessity of knowing the vehicle model in order to properly control the vehicle stability. Hallowell and Ray (2003) developed a traction control algorithm by using independent torque control on each wheel.

SVM based road surface detection algorithm is proposed for automotive active safety products. From the experimentation, it has been observed that the proposed system is capable of increasing the efficiency of the automotive active safety products.

The analysis of the stopping distance report shows that stopping distance is reduced drastically with the new proposed algorithm. The experimental results obtained illustrate that the system helps to enhance the automotive active safety product performance.

6.2 FUTURE WORK

In future, it can be extended for night conditions as well, by providing infrared cameras or night vision cameras for surface detection. This will really help the driver and assist him for the night driving. Further this algorithm can be improved if detection of surfaces such as ice, snow and water can be done based on the specularity of such surfaces.
The same algorithm can be implemented in most of the Value Added Functions (VAF) of the Active safety system like Cruise Control (CC), Adaptive Cruise Control (ACC), Hill Hold Control (HHC), Hill Decent Control (HDC), Brake Disc Wiping (BDW), etc., and add value to the value added functions.

This can also be utilized by the autonomous car and potentially improves the performance not only the active safety products but also in the areas like driver assistance, passive safety, etc,

This algorithm can also detect the lane change and compare it with the steering input. If there is a lane change without the steering input, then it can warn the driver that vehicle is moving out without his control and assist him to take necessary action to control the vehicle.