Abstract

The Active Anti-roll bars (AARB) system in vehicles has recently become one of the research hotspots in the field of vehicle technology to improve the vehicle's active safety. In most off-road vehicles, high ground clearance is required while keeping all wheels in contact with the ground in order to improve traction and maintain load distribution amongst the wheels. However, a problem arises in some types of the off-road vehicles when the vehicle is operated at high speed on smooth road. In such condition, the combination of the vehicle's high center of gravity position, large suspension stroke and soft spring construction create a stability problem, which could make the vehicle liable to rollover.

The goal of this research is to solve the problem without sacrificing passengers' comfort. This can be achieved by investigating the possibility of using a controllable suspension system that uses a modified active anti-roll bar system. The main advantage of the proposed system modification is its short convergence time and quick learning speed as well as the good expected performance of the closed loop system. An Active anti-roll bar will be investigated first then a proposed design for a magnetorheological fluid anti-roll bar will be presented and modeled.

This research will focus on vehicles that require both good on-road handling as well as good off-road ride comfort. This class of vehicle includes military vehicles and sports utility vehicles (SUV’s). After completing a comprehensive literature survey, a new mathematical model of the system and a proposed controller will be created and simulated. The results will then be validated by comparing them to those obtained in previous research attempts and then analyzed to reach final conclusions and suggested future work.