

Abstract

The purpose of this project is to study and improve the performance of the lateral dynamics of a highway vehicle using a phase-lead controller. Due to the difficulty of obtaining a real vehicle and its transfer function, a given transfer function from an IEEE article is used to do the analysis. By analyzing the transfer function of the vehicle's lateral dynamics and using control theory, an appropriate phase-lead controller is designed to improve the stability. Simulations using Simulink are used in order to analyze the step response of the system before and after the addition of the controller. A circuit is then designed in order to simulate this system's transfer function. This circuit is tested using Multisim, and then built on a breadboard to test the results in a physical circuit. The results of the simulated controller showed a reduction in the overshoot from 37.6% to 12.0% and an increase in the settling time from 0.705s to 0.91s. The physical circuit yielded a reduction in the overshoot from 54% to 22% with an increase in settling time from 0.79s to 0.94s.