

New Suspension Mechanism for a Formula Car using Camber Thrust

Authors : Shinji Kajiwar

Abstract : The basic ability of a vehicle is the ability to “run”, “turn” and “stop”. The safeness and comfort during a drive on various road surfaces and speed depends on the performance of these basic abilities of the vehicle. Stability and maneuverability of a vehicle is vital in automotive engineering. Stability of a vehicle is the ability of the vehicle to revert back to a stable state during a drive when faced with crosswind and irregular road conditions. Maneuverability of a vehicle is the ability of the vehicle to change direction during a drive swiftly based on the steering of the driver. The stability and maneuverability of a vehicle can also be defined as the driving stability of the vehicle. Since fossil fueled vehicle is the main type of transportation today, the environmental factor in automotive engineering is also vital. By improving the fuel efficiency of the vehicle, the overall carbon emission will be reduced thus reducing the effect of global warming and greenhouse gas on the Earth. Another main focus of the automotive engineering is the safety performance of the vehicle especially with the worrying increase of vehicle collision every day. With better safety performance on a vehicle, every driver will be more confidence driving every day. Next, let us focus on the “turn” ability of a vehicle. By improving this particular ability of the vehicle, the cornering limit of the vehicle can be improved thus increasing the stability and maneuverability factor. In order to improve the cornering limit of the vehicle, a study to find the balance between the steering systems, the stability of the vehicle, higher lateral acceleration and the cornering limit detection must be conducted. The aim of this research is to study and develop a new suspension system that that will boost the lateral acceleration of the vehicle and ultimately improving the cornering limit of the vehicle. This research will also study environmental factor and the stability factor of the new suspension system. The double wishbone suspension system is widely used in four-wheel vehicle especially for high cornering performance sports car and racing car. The double wishbone designs allow the engineer to carefully control the motion of the wheel by controlling such parameters as camber angle, caster angle, toe pattern, roll center height, scrub radius, scuff and more. The development of the new suspension system will focus on the ability of the new suspension system to optimize the camber control and to improve the camber limit during a cornering motion. The research will be carried out using the CAE analysis tool. Using this analysis tool we will develop a JSAE Formula Machine equipped with the double wishbone system and also the new suspension system and conduct simulation and conduct studies on performance of both suspension systems.

Keywords : automobile, camber thrust, cornering force, suspension

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020