

Design and Validation of Different Steering Geometries for an All-Terrain Vehicle

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Abstract : The steering system is an integral part and medium through which the driver communicates with the vehicle and terrain, hence the most suitable steering geometry as per requirements must be chosen. The function of the chosen steering geometry of an All-Terrain Vehicle (ATV) is to provide the desired understeer gradient, minimum tire slippage, expected weight transfer during turning as these are requirements for a good steering geometry of a BAJA ATV. This research paper focuses on choosing the best suitable steering geometry for BAJA ATV tracks by reasoning the working principle and using fundamental trigonometric functions for obtaining these geometries on the same vehicle itself, namely Ackermann, Anti-Ackermann, Parallel Ackermann. Full vehicle analysis was carried out on Adams Car Analysis software, and graphical results were obtained for various parameters. Steering geometries were achieved by using a single versatile knuckle for frontward and rearward tie-rod placement and were practically tested with the help of data acquisition systems set up on the ATV. Each was having certain characteristics, setup, and parameters were observed for the BAJA ATV, and correlations were created between analytical and practical values.

Keywords : all-terrain vehicle, Ackermann, Adams car, Baja Sae, steering geometry, steering system, tire slip, traction, understeer gradient

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