

An Investigation on the Effect of Lateral Motion on Normal Forces Acting on Each Tires for Nonholonomic Vehicle

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Abstract:

Stability of vehicle has been the topic of interest among researchers for decades. Research conducted on vehicle stability relies on the vehicle's lateral and longitudinal dynamics. In order to determine the longitudinal and lateral force acting on tires, the normal force that acts on the tire is required. Furthermore, the forces generated to move the vehicle are dependent on the vehicle's mass. Smaller force is generated if the mass is low and vice versa. Therefore, in this paper, the vehicle modelling is conducted to determine the effect of lateral motion on the normal force generated. Dugoff's tire model and combined vehicle dynamics are used to determine the characteristic of the vehicle. The lateral and longitudinal acceleration generated is used to calculate the normal force generated on each tire. Based on the result, a significant change in normal forces can be observed on each tire when a steering input of 0.05 rad is given. This shows a significant correlation between the lateral motion and normal tire force. Results obtained shows that normal force acting on the left and right side of the tires is affected by the direction of the lateral motion of the vehicle.

Keywords: Combined vehicle dynamics; Dugoff's model; Vehicle stability

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