

# Normal Forces Effects of a Two In-Wheel Electric Vehicle Towards the Human Body



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**Abstract** Traditionally, in order to comprehend the impact of vibration on human and vehicle ride comfort, past research often models the human biodynamic and vehicle models individually. Recent trends suggest that a better understanding of the behaviour could be achieved by fusing the models instead of analysing it separately. The present study evaluates the impact of the normal forces on specific parts of the human body. A human biodynamic model with five degrees of freedom is modelled together with a two in-wheel electric car model travelling at a speed of 10 km/h to investigate the effect of the normal forces. From the present investigation, it could be observed that the proposed model could highlight the impact of the normal forces on the body parts when the car is travelling either on a straight path or in taking corners.

**Keywords** Vehicle vibration · Human biodynamic model · Ride comfort

## 1 Introduction

Car driver and passengers are susceptible to vibrations that originate largely from the vehicle owing to the interaction between the road and the vehicle itself. Although it is not apparent, it has been reported that prolonged exposure does to a certain degree bring about harmful effects towards human health, for instance, back problem, effects on the digestive system and decrease in the alertness level which in turn, could lead to road accidents amongst others [1]. It is also worth mentioning that, abrupt manoeuvre or braking may deteriorate the human comfort level and even injury during travelling

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