

# Dynamic Performance Evaluation of a Personal Mobility Vehicle (PMV) with an Inward Tilt Mechanism on Non-flat Road Using Dynamic Motion Analysis Simulation

Tetsuya Kaneko<sup>1)</sup> Tetsunori Haraguchi<sup>2)</sup> Ichiro Kageyama<sup>2)</sup>

*1) Department of Mechanical Engineering for Transportation, Faculty of Engineering, Osaka Sangyo University  
3-1-1 Nakagaito, Daito, Osaka, Japan*

*2) Department of Mechanical Engineering, College of Industrial Technology, Nihon University, Chiba, Japan*

**KEY WORDS:** Vehicle development, Personal mobility, simulation, frequency response, Transient Response (B2)

Many technologies have been developed over the years since automobiles became widespread for road traffic. However, the traffic jams has always been a major problem in the road traffic society. As one of the factors, it is often used by a small number of passengers such as one or two people per car. Therefore, the limited road area is not effectively utilized. And in urban areas, it is difficult to secure sufficient parking space. In recent years in Japan, many laws and regulations on road traffic for small vehicles have been enacted, and the infrastructure developments for mass production and popularization of personal mobility vehicle are progressing.

We have been proposing and developing a personal mobility vehicle (PMV) with a passenger capacity of one or two and a small area occupied on the road. The vehicle has three or four wheels and has a mechanism that leans inward to the turning direction like a motorcycle when it turns. There are many unexamined analyzes of vehicle characteristics that combine the characteristics of passenger cars and motorcycles.

Although, automobile tires have a significant ground camber angle when traveling on rutted roads, they do not have it on slant roads because the vehicle body tilts along the road surface. On the other hand, in PMV that tilts inward when turning like motorcycles, the vehicle body always keeps upright when traveling both on slant roads. Therefore, the tires have ground camber angles on both types of road surface. In this paper, we describe the requirements for maintaining stable straight running even under such road surface disturbances. This straight running ability can be a remarkable strong point of PMV with an inward tilt mechanism with a vehicle dynamics simulations.

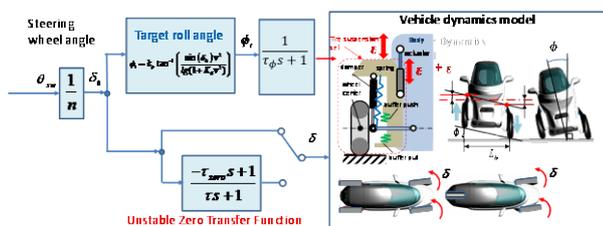


Fig.1 Steering system and mechanical active lean system

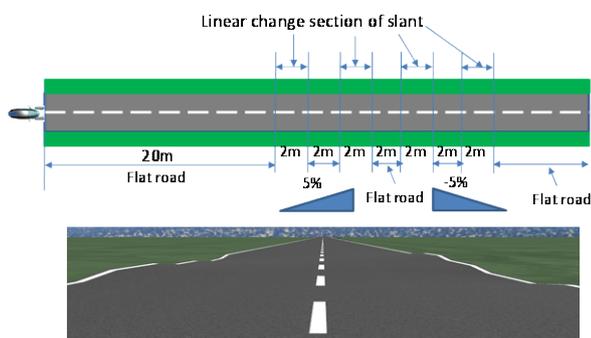


Fig. 2 Simulation course with slant road

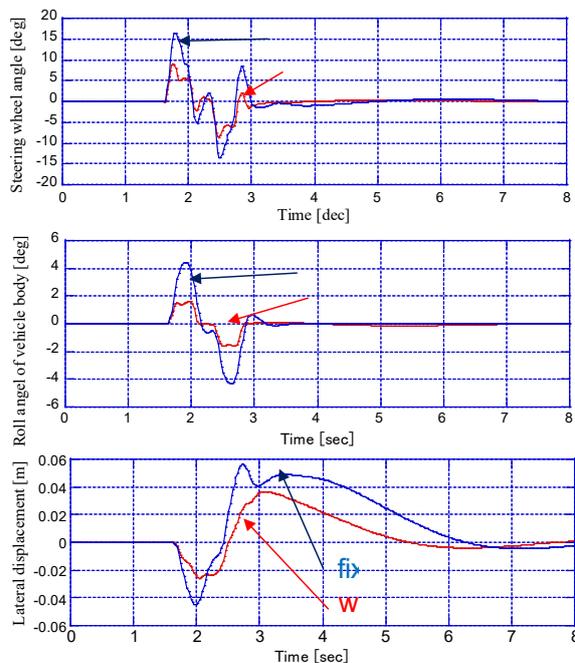


Fig. 3 Simulation results with multi body vehicle model