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Human like driver behavior under crosswind conditions based on driving simulator study

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ABSTRACT

In the existing wind-vehicle-bridge interaction framework, vehicle safety is still calculated using the three accident indicators proposed by Baker(Baker, 1994). However, without a driver behavior model, it is impossible to perform time-domain calculations for the entire bridge driving process in the wind-vehicle-bridge interaction. This study addresses the vehicle response under sudden crosswind conditions by utilizing an 8-degree-of-freedom virtual driving simulator from Tongji University. By simulating actual sudden crosswind scenarios and analyzing steering wheel angle, a complete process for wind-vehicle-bridge interaction is achieved. The fitting result is

$$\delta = -0.054\alpha_f + 0.0625\dot{e}_1 - 1.322e_2$$

Where, α_f is the front wheel sideslip angle, $\dot{e}_1$ is the the vehicle's lateral speed error, e_2 is the vehicle's yaw angle error and δ is the steering wheel angle.

Fig. 1 Virtual driving simulator in Tongji University

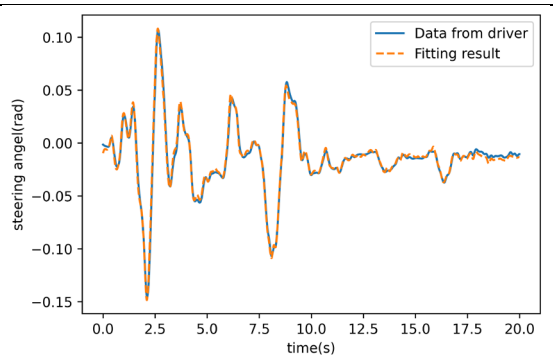

Fig. 2 Fitting result of steering angle in a case study

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REFERENCES

Baker, C.J., 1994. The quantification of accident risk for road vehicles in cross winds. Journal of Wind Engineering and Industrial Aerodynamics 52, 93–107.