Digital Twin-Driven Structural Health Monitoring of Roads

Zhaojie Sun*, Lavindra de Silva, Ioannis Brilakis
***Email address: zs442@cam.ac.uk**

Research motivation and objective

- **Motivation**: In the process of creating a digital twin of roads, the structural health information of existing roads is an important component to help formulate accurate maintenance and rehabilitation strategies.
- **Objective**: This research aims to obtain the structural health information of roads in service by analysing Non-Destructive Testing (NDT) results.

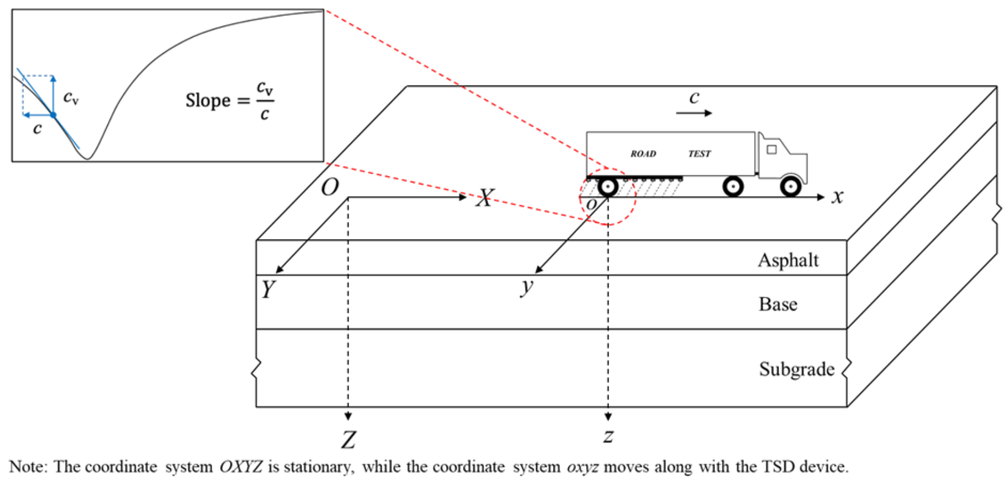
Expected research outcome and impact

- **Expected outcome**: In this research, a tool which can evaluate the structural health and predict the remaining life of existing roads will be developed.
- **Impact**: The research outcome can provide structural health information to a digital twin of roads, which helps maintain the high service performance of existing roads and improve people's quality of life.

Development of a theoretical road model: PaveMove

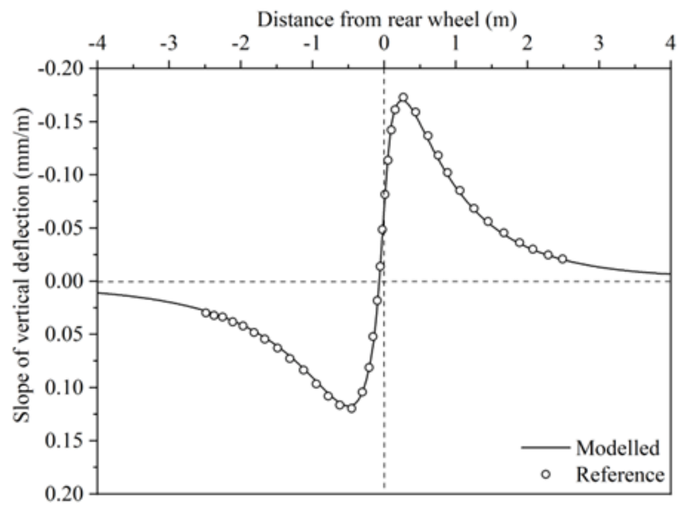
A theoretical model of the Traffic Speed Deflectometer (TSD) test of roads has been developed and validated.

The TSD device



Note: The coordinate system *OXYZ* is stationary, while the coordinate system *oxyz* moves along with the TSD device.

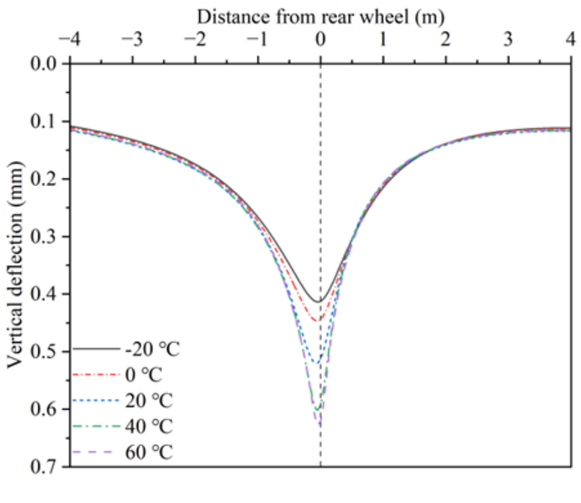
A theoretical model of the TSD test



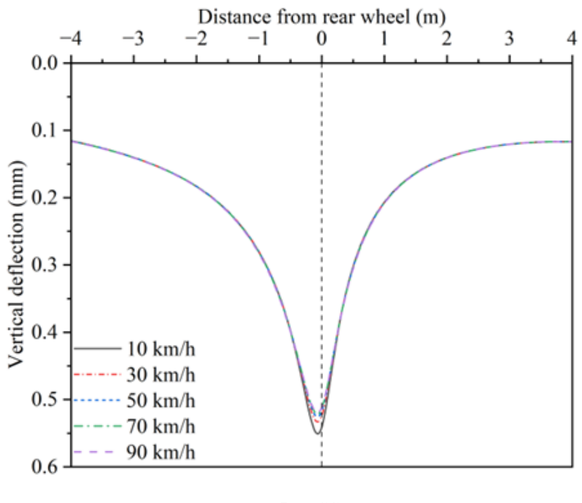
Model validation

Response analysis of asphalt pavements in TSD tests

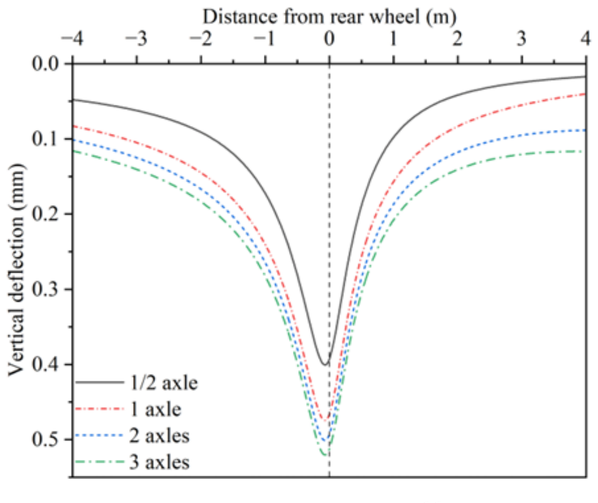
PaveMove was used to investigate the response characteristics of asphalt pavements in TSD tests.



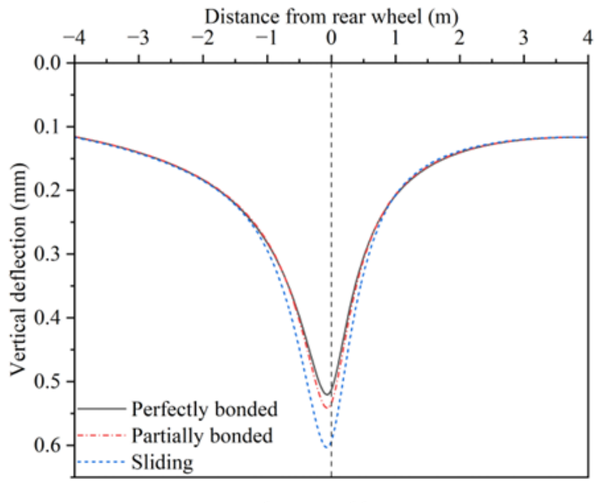
Temperature effect



Speed effect



Load superposition effect



Interface effect

What's next?

The following tasks will be completed in the coming period:

- Develop a parameter back-calculation technique for the TSD test of roads.
- Validate the practical performance of the developed technique using TSD field measurements.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 101034337.

Reference

- Zhaojie Sun, et al. Analysis of the response of asphalt pavements in Traffic Speed Deflectometer tests using PaveMove.