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Recent advances in the evaluation of the strength and deformation properties of flexible pavements using GPR

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Even though there is plenty of literature contributions related to the non-destructive evaluation of road pavements using ground-penetrating radar (GPR), with several purposes spanning from the layer thicknesses evaluation to the detection of highly wet spots in the subsurface, there is still a lack of highly-reliable results concerning the mechanical assessment of road pavements, by using this technology.

This work endeavours to face this topic and proposes a semi-empirical model for predicting the elastic modulus of a flexible pavement, by employing GPR. Data were collected over three different road sections within the districts of Madrid and Guadalajara, Spain. In particular, GPR surveys were carried out at the speed of traffic over the roads N320 and N211 in the district of Guadalajara and the road N320 in the district of Madrid, for a total of 39 kilometers, approximately. In particular, air-coupled radar systems with a 1000 MHz center frequency antenna and two different 2000 MHz center frequency antennas, mounted onto an instrumented vehicle, were here employed. The calibration of the model was then performed by exploiting ground-truth data coming from other non-destructive technologies. In more details, an instrumented lorry equipped with a curviameter, namely, a deflection tool capable to collect and process continuously and in real time the mechanical response of the flexible pavement, was used in the above road sections. Promising results are here presented, and the potential of GPR for monitoring the mechanical performances of a road network is also proved.

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