

Improvements of Neural Networks Application for Backcalculation

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ABSTRACT: Road pavements require maintenance in order to provide good service levels during their life period. Because of the significant costs of this operation, the timing of each maintenance intervention should be carefully planned, to avoid unnecessary interventions, but also to prevent irreparable damages to the pavement and avoid safety faults of the pavement. Nowadays, there is a wide array of tools available on the market to do surveys on road pavements. Equipments like the Falling Weight Deflectometer complemented with the Ground Penetrating Radar provide huge amounts of data, allowing performing analysis along the pavement, in a continuous way, instead of analyzing just target points of the pavement. The analysis of this data, however, can be complex and time consuming, becoming a troublesome task. To solve this problem, the use of Artificial Neural Networks (ANN) to perform the backcalculation of the data acquired was tested. With these tools it is possible to perform the structural characterization almost instantaneously, saving time and resources and, at the same time, providing results within the expected range. Taking into account that the performance of the ANN can be improved if the number of outputs is reduced, a study was performed aiming at developing dedicated ANNs for structural characterization of the pavement. The sensitivity of the ANNs response to changes in inputs is addressed, aiming at quantifying the influence of an erroneous measurement. In this study, a computer program was developed, using MATLAB, in order to create, train and tests the Artificial Neural Networks. Using this program, the pavement layer moduli can be evaluated using ANNs. This paper presents the methodology adopted for the study, the main results obtained and final considerations regarding ANN application to pavement structural evaluation.

KEY WORDS: Pavements, Characterisation, Evaluation, Artificial Neural Networks.