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PERFORMANCE EVALUATION OF ROUGHNESS MEASURING DEVICES TO MEASURE RIDE NUMBER AND INTERNATIONAL ROUGHNESS INDEX

PROBLEM STATEMENT

Pavement smoothness/roughness is gaining growing importance as an indicator of a pavement condition, both in terms of performance and as a major determinant of road user costs. Therefore, attaining acceptable surface smoothness on newly constructed or rehabilitated pavements is becoming a major concern to highway agencies. This need to quantify pavement surface smoothness has resulted in a number of measurement techniques and devices. Of greater interest to highway agencies are those that would provide for versatility and ease and speed of use. Considerable attention has been particularly focused on the height sensor-based technology. It is potentially well-suited for surveying the surface condition of pavement sections while operating at highway speed. However, presently, there are no accepted standards or practical references with which the profiling results can be compared to determine the bias in the measurements. Several calibration studies have indeed been conducted throughout the years without the benefit of a reference measurement that is considered the true profile of the road. Without such a measurement, it is difficult to appropriately assess the accuracy of the profilers.

OBJECTIVES

The main purpose of this research project was to develop and validate a practical tool to serve as a means of performing reference calibration for the FDOT High-Speed Profilers.

FINDINGS AND CONCLUSIONS

This project resulted in a tool, referred to as a USF Walking Profiler, that can reference and calibrate smoothness measurements (both in terms of International Roughness Index, or IRI, and Ride Number, or RN) as determined using the current the FDOT High-Speed Profiler.

The USF Walking Profiler demonstrated satisfactory repeatability in profile measurement. Thus, there is no need to perform more than three repeated runs, since the difference between the runs can be ignored (if the data collection procedure is well controlled). In addition, a comparative analysis showed a good correlation between a High-Speed and the USF Walking Profilers when the High Speed Profiler was operated at different sampling rates and operating speeds. In addition, since the USF Walking Profiler is considered to be a Type I roughness measuring device, it could be used as a reference calibration tool for FDOT's High-Speed laser profilers for measuring both RN and IRI.

BENEFITS

As travel safety and efficiency are gaining growing importance to state agencies, smoothness measurements have become an important tool in the management of pavement surfaces. They are being used to determine the condition/performance of the various in-service pavement sections, and assess the need for rehabilitation and maintenance. As with any testing that uses subject-driven, instrumented vehicles, the major concerns of the end usefulness of the resulting data are accuracy and precision. Although a level of uncertainty is always inherent to any measurement process, and, thus, must be accepted, it must also be appropriately quantified or assessed. The device developed in this study would provide a means for reference calibration to check the appropriate precision of our laser profilers. This would, in turn, ensure that our field measurements (both at the project and network levels) are reliable, repeatable, and reproducible with a high confidence level.

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