A PROBABILISTIC CHARACTERIZATION OF ACOUSTIC PROPERTIES OF SOME SURFACE TEXTURES

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Contemporary efforts to render pavements quieter have triggered many innovative surface types particularly in concrete pavements. These include the hessian drags, the diamond grinding types and pervious concrete groups. These groups in addition to the transversely tined group are replete with various parametric combinations to enhance certain required surface properties such as sound absorption, tire pavement interaction noise, friction and ride quality.

The goal for the ideal pavement surface is to optimize all the desired surface for friction, ride, tire-pavement interaction noise and sound absorption. Various texture types respond differently to time, traffic, temperature and other variables. In consequence, a categorical arrangement of texture types in order of quietness is hamstrung by seasonal fluctuations and configuration changes in texture over time. Detrending the data in time series is frustrated by the absence of winter testing. In that arrangement an uneven interval introduces an unwarranted complication to an autoregressive moving average time series analysis. Additionally, the novelty of most of the test cells do not easily allow for tenable detrending to distinguish between seasonal fluctuations and actual performance. Therefore a categorization of these texture types in ascending or descending order of quietness is achieved through measurement of acoustic properties over 16 seasons of testing, multiple runs in each test and an *a-posteriori* presentation of pavement acoustics in a probability density function.

This method determines the likelihood of attaining a quietness level based on data from a four year period of measurement and better predicts the performance of the texture types. The quietest surface based on a probability density function is the “2010 ultimate grinding” configuration that is found to be quieter than pervious concrete, porous asphalt and bituminous pavements. The rigid pavements were generally getting quieter with time, while the flexible pavements were initially quiet but getting louder with time. The noisiest surface is the transversely tined concrete pavement and the chip sealed asphalt pavements. Data indicates that the likelihood that in a randomly chosen pair of a flexible pavement and a rigid pavement the former is quieter than the latter was 55%. There was an infinitesimal likelihood of a longitudinally textured surface being louder than a transversely textured surface.