

## Application of noise-cancelling and smoothing techniques in road pavement vibration monitoring data

**Authors:** Amir Shtayat, Sara Moridpour, Berthold Best, Hussein Daoud

**Abstract:** Road pavement surfaces need routine and regular monitoring and inspection to keep the surface layers in high-quality condition. However, population growth and the increase in the number of vehicles and the length of road networks worldwide have required researchers to identify appropriate and accurate road pavement monitoring techniques. The vibration-based technique is one of the effective techniques used to measure the condition of pavement degradation and the level of pavement roughness. The consistency of pavement vibration data is directly proportional to the intensity of surface roughness. Intense fluctuations in vibration signals indicate possible defects at certain points of road pavement. However, vibration signals typically need a series of pre-processing techniques such as filtering, smoothing, segmentation, and labelling before being used in advanced processing and analysis. This research reports the use of noise-cancelling and data-smoothing techniques, including high pass filter, moving average method, median, Savitzky-Golay filter, and extracting peak envelope method to enhance raw vibration signals for further processing and classification. The results show significant variations in the impact of noise-cancelling and data-smoothing techniques on raw pavement vibration signals. According to the results, the high pass filter is a more accurate noise-cancelling and data smoothing technique on road pavement vibration data compared to other data filtering and data smoothing methods.