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## DETERMINATION OF RAILWAY TRACK VERTICAL IRREGULARITIES FROM MEASURED ACCELERATIONS OF FREIGHT CAR AXLEBOXES

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This work is devoted to the development of approaches to the determination of the actual irregularities of a railway track. Such irregularities are traditionally used as input disturbance components in the simulation of the dynamic behavior of a moving vehicle. The aim of this work is to develop a track irregularity determination method that would be more accurate and easier in use than the processing of track measurement car records. For vertical irregularities in the assumption that no wheel–rail detachment occurs, this problem is proposed to be solved by double integration of recorded accelerations of freight car axleboxes. A method of numerical integration of processes in the frequency domain using the Fourier transform is considered. To eliminate components that depend on the initial conditions and cause the results of integration to deviate from the true ones, a filtering algorithm is used. The proposed approach is verified by applying it to the integration of a harmonic function defined analytically and an experimentally obtained random process. The calculated estimates of the displacements of a given point of a mechanical system are compared with their values known a priori. The lower and the upper limits of the filtering band of the resulting process are determined. The high accuracy of the integration results on application of bandpass filtering is shown. The approach to track irregularity determination considered in this paper may extend the range of analyzable track irregularity lengths in comparison with those correctly extracted from track measurement car records.

The proposed method of double integration in the frequency domain in combination with bandpass filtering may be used not only in the determination of railway track irregularities, but also in the solution of other engineering problems involving the integration of experimentally obtained signals.

**Keywords:** *railway track irregularities, axlebox accelerations, integration, Fourier transform.*

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