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APPLICATION OF 1-D AND 2-D WAVELET TRANSFORM TO CRACK IDENTIFICATION IN STATIC AND DYNAMIC LOADED PLATES

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The paper presents the issue of damage detection in thin plates considering the influence of dynamic characteristics, especially with regard to the modes of vibration as well as excitation by static loads. The Kirchhoff plate bending is described and solved by the Boundary Element Method (BEM). Rectangular plates supported on boundary and resting on the internal columns (Fig. 1a) with properties E = 205 GPa, ν = 0.3 and thickness h = 0.04 m are examined. Defect is introduced by the additional edges forming a crack in relation to the plate domain. The analyses of static or dynamic structural response are conducted with the use of Discrete Wavelet Transform (DWT). Signal decomposition according to the Mallat pyramid algorithm [1] is applied. In dynamic experiments the plate performs vibrations similar to natural modes. Measured variables are vertical displacements amplitudes in N = 64 points distributed along the line determined by the y distance. The exemplary analysis of the obtained signal for first mode while using Daubechies 4 wavelet is presented in Fig. 1b. The results of 2-*D* DWT in static tests will be presented as well.

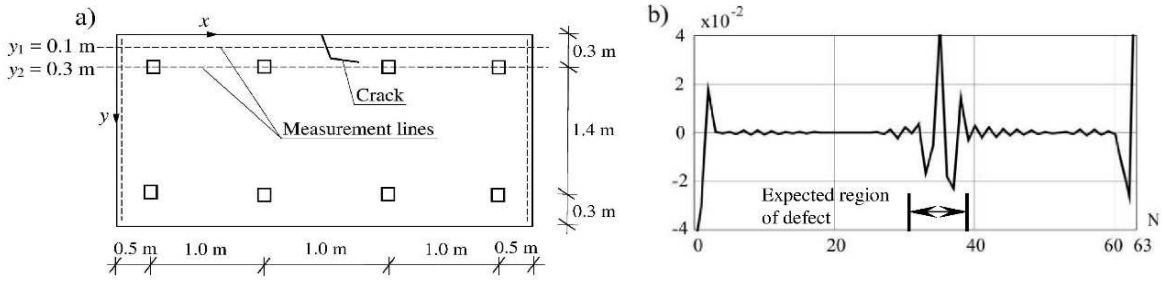

Figure 1: Plate structure – a), DWT of displacement amplitudes for y_2 line, 1st mode – b)

Achieved results of the study, backed up by previous research [2], confirmed the effectiveness of the proposed method of damage detection since the evident disturbances of the transformed signals undoubtedly indicates the presence and location of the crack.

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