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Within the last two decades the wavelet transformation has become a powerful instrument in many engineering disciplines. The most well-known applications are found in signal processing. [Zabel, 2003] and [Brehm, 2004] apply the wavelet transformation in structural dynamics to system identification problems.

There the equation of motion is defined as

$$[M]\{\ddot{x}\} + [C]\{\dot{x}\} + [K]\{x\} = \{f\}. \quad (1)$$

The stiffness matrix $[K]$, damping matrix $[C]$ and mass matrix $[M]$ can be identified from an excitation force $\{f\}$ and a response signal of accelerations $\{\ddot{x}\}$, velocities $\{\dot{x}\}$ or displacements $\{x\}$. Hence, equation (1) can be modified for any instant i at wavelet decomposition level j as the identification objective function

$$\|[M]\{d_{j,i}^{\ddot{x}}\} + [C]\{d_{j,i}^{\dot{x}}\} + [K]\{d_{j,i}^x\} - \{d_{j,i}^f\}\|^2 \rightarrow \text{MIN}, \quad (2)$$

where the vectors $\{d_{j,i}^{\ddot{x}}\}$, $\{d_{j,i}^{\dot{x}}\}$, $\{d_{j,i}^x\}$ and $\{d_{j,i}^f\}$ contain the wavelet coefficients of the accelerations, velocities, displacements and excitation, respectively. In Eq. (2), approximation coefficients can be used instead of wavelet coefficients.

In this study orthogonal and biorthogonal wavelet packets are applied in system identification. Even though the decomposition of the approximations and the details is more time and memory consuming, the advantages are dominating. The wavelet packet approach provides a higher frequency resolution, which is adjutant with respect to the separation of close modes and the appropriate weighting.

Current research is focused on the investigation of the effective automatic search of suitable coefficients.

[Brehm, 2004] Brehm, M.; Zabel, V.; Markwardt, K.: *Applications of Biorthogonal Wavelets in System Identification*. P. Neittaanmäki, T. Rossi, K. Majava, and O. Pironneau (eds.) Proceedings of the 4th ECCOMAS, Jyväskylä. 2004

[Zabel, 2003] Zabel, V.: *Applications of Wavelet Analysis in System Identification*. PhD thesis. Bauhaus-University, Weimar. 2003