THE ONE DIMENSIONAL REGULARITY OF THE CONTINUOUS WAVELET TRANSFORM APPLIED TO WEAK SOLUTIONS

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Abstract

The continuous wavelet transform for functions f in $L^2(\mathbb{R})$ is used to prove that f is of class C^k in a neighborhood of b_0 in $\mathbb{R}$ if and only if the kth derivative of the wavelet transform exists in a neighborhood of b_0. Moreover, if u in $L^2(\mathbb{R})$ is a weak solution of $Qu = f$, where Q is a linear differential operator of pure order p with positive constant coefficients and f is of class C^k in a neighborhood of b_0 in $\mathbb{R}$, then u is of class C^{k-1+p} in a neighborhood of b_0 in $\mathbb{R}$.