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Generalized module of smoothness, K -functionals and approximation methods

The concept based on the principle that smoothness can be generated by a function, which is close in a certain sense to a homogeneous function of a positive order on an interval containing the point 0, is discussed. It is shown that module of smoothness, K -functionals and approximation errors of various linear approximation methods can be obtained, if the generator of smoothness ψ is extended from the original interval to \mathbb{R}^d by periodicity, homogeneity and by 1, respectively. This observation enables us to obtain the results on equivalences of the values listed above by applying the multiplier theory. This approach is illustrated by the simplest example of the Fejér means, the K -functional related to the Riesz derivative and a certain new relevant modulus of smoothness of order 1.