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Weighted Laplacian Evolution Equation and Signal Decomposition

We show the existence of solutions for new types of weighted Laplacian wave equations and their applications in signal processing in which a signal is decomposed into four parts. The presence of solutions is proved by the Faedo-Galerkin method. The spectrum and decomposition of a signal are created through the discrete solutions of the equations in Matlab. Fractional order Laplacian and fractional order derivatives are expressed explicitly in the introduced equations, so it is easy to implement in Matlab.