Approximation numbers = eigenvalues

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We discuss the approximation numbers, which in a sense measure the degree of compactness of an operator, for a simple weighted integral operator in L^p and show that they are the eigenvalues of a non-linear boundary value problem for a differential equation reminiscent of a Sturm-Liouville operator. Asymptotic formulas for these numbers are also derived, using a kind of generalized Prüfer transform, which also give oscillation properties for the eigenfunctions analogous to those of a standard Sturm-Liouville equation.