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**Physics > Computational Physics** 

# Solution of the Schrödinger equation containing a Perey-Buck nonlocality

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The solution of a radial Schr\"odinger equation for  $\{\pris}(r)$  containing a nonlocal potential of the form  $\inf\{K(r,r') \pris}(r')$  dr's is obtained to high accuracy by means of two methods. An application to the Perey-Buck nonlocality is presented, without using a local equivalent representation. The first method consists in expanding  $\{\pris}$  in a set of Chebyshev polynomials, and solving the matrix equation for the expansion coefficients numerically. An accuracy of between 1:10^{6} to 1:10^{14} is obtained, depending on the number of polynomials employed. The second method consists in expanding  $\{\pris}$  into a set of N Sturmian functions of positive energy, supplemented by an iteration procedure. For N=15 an accuracy of 1:10^{4} is obtained without iterations. After one iteration the accuracy is increased to 1:10^{6}. The method is applicable to a general nonlocality K.

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