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Solution of the Schrödinger equation containing a Perey-Buck nonlocality

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(Submitted on 2 Apr 2012 (v1), last revised 9 May 2012 (this version, v2))

The solution of a radial Schr\"odinger equation for {\psi}(r) containing a nonlocal potential of the form \int{K(r,r') {\psi}(r') dr'} 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 {\psi} 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 {\psi} 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.

Comments:	one table, 16 figures; to be published in Nucl. Phys. A
Subjects:	**Computational Physics (physics.comp-ph)**; Nuclear Theory (nucl-th)
Cite as:	**arXiv:1204.0458 [physics.comp-ph]**
	(or **arXiv:1204.0458v2 [physics.comp-ph]** for this version)

Submission history

From: George H. Rawitscher [view email]
[v1] Mon, 2 Apr 2012 16:29:17 GMT (136kb)
[v2] Wed, 9 May 2012 19:05:59 GMT (138kb)

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