
GABOR KUNSTATTER, University of Winnipeg
Quantum mechanics on the discretized half-line

We investigate nonrelativistic quantum mechanics on the discretized half-line, constructing a one-parameter family of Hamiltonians that are analogous to the Robin family of boundary conditions in continuum half-line quantum mechanics. For classically singular Hamiltonians, the construction provides a singularity avoidance mechanism that has qualitative similarities with singularity avoidance encountered in loop quantum gravity. Applications include the free particle, the attractive Coulomb potential, the scale invariant potential and a black hole described in terms of the Einstein-Rosen wormhole throat. The spectrum is analyzed by analytic and numerical techniques. In the continuum limit, the full Robin family of boundary conditions can be recovered via a suitable fine-tuning but the Dirichlet-type boundary condition emerges as generic.