

Abstract

The boundary wall method (BWM) is a general purpose protocol to treat boundary value problems for wave equations, specially Helmholtz (the case addressed here). Similarly to most approaches, the BWM may be computationally demanding for large borders C , at which the wave function must satisfy specified boundary conditions. Also, despite the fact the BWM is an exact procedure, usually it is not amenable to closed form solutions. The BWM relies on the Green's function G_0 of the embedding domain V of C . However, in many instances like for C modeling a billiard the specific V is not really fundamental and thus one has a certain freedom to choose distinct domains and so G_0 's. Here we consider this characteristic of the BWM and show how to obtain some analytical results and solve numerically semi-infinite waveguides by exploring proper Green's functions. As examples, we discuss rectangular, triangular and trapezoidal structures with both Dirichlet and leaking boundaries as well as scattering states within semi-infinite rectangular waveguides.