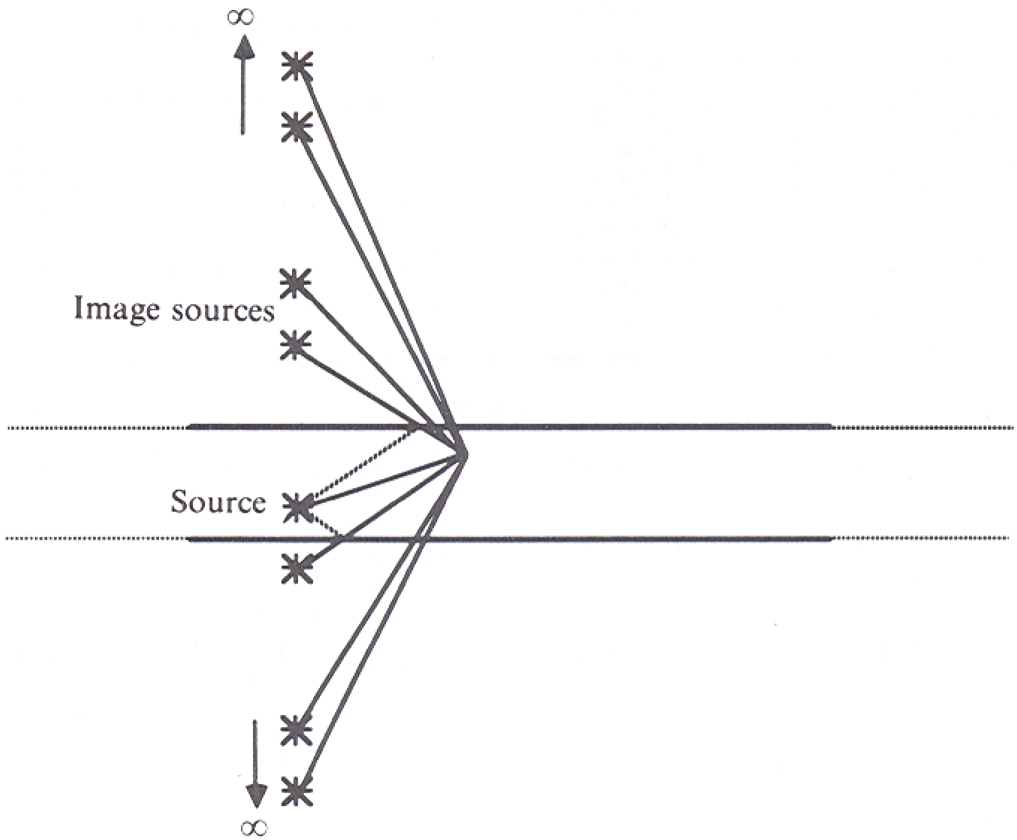

The pressure/particle velocity fields in proximity to the actual sound source inside the duct are determined largely by the image source(s) nearest to the actual sound source; the solution converges rapidly as the number of image sources is increased. However, accuracy in calculating the pressure / particle velocity fields far from the actual sound source (*i*.*e*. further down the duct, $\Delta x \gg a$) requires increasingly larger numbers of image sources to be included.

The image source technique is widely used *e*.*g*. in computational modeling of room acoustics.

The complex ***frequency*-*domain*** 2-D vector specific impedance/admittance, acoustic energy flow velocity, acoustic intensity and purely real, scalar energy densities, *etc*. inside the duct can all be computed (most easily accomplished *e*.*g*. via numerical computation…) from their definitions, for a given sound source & frequency:

$$\vec{\tilde{z}}_a(x,y,\omega) \equiv \frac{\tilde{p}(x,y,\omega)}{\vec{\tilde{u}}(x,y,\omega)} = \frac{\tilde{p}(x,y,\omega)\cdot\vec{\tilde{u}}^*(x,y,\omega)}{\left|\vec{\tilde{u}}(x,y,\omega)\right|^2} \quad (\Omega_a) \quad \text{and:} \quad \vec{\tilde{y}}(x,y,\omega) \equiv \frac{\vec{\tilde{u}}(x,y,\omega)}{p(x,y,\omega)} \quad (\Omega_a^{-1})$$

$$\vec{\tilde{c}}_a(x,y,\omega) = \frac{1}{\rho_o}\vec{\tilde{z}}_a(x,y,\omega) \quad (m/s) \quad \text{and:} \quad \vec{\tilde{I}}_a(x,y,\omega) \equiv \frac{1}{2}\tilde{p}(x,y,\omega)\cdot\vec{\tilde{u}}^*(x,y,\omega) \quad (Watts/m^2)$$