

Example: Linear wave equation with  $f \neq 0$ ,  $g = 0$

The pde and initial condition are given by

$$u_{tt} - u_{xx} = 0, \quad -\infty < x < \infty, \quad t > 0,$$

with

$$u(x, 0) = \frac{1}{1+x^2}, \quad u_t(x, 0) = 0.$$

Using the method of characteristics (MOC), the solution is given by

$$u(x, t) = \frac{1}{2} \left[ \frac{1}{1+(x-t)^2} + \frac{1}{1+(x+t)^2} \right].$$

