

# Numerical Methods for Conservation Laws

## Assignment 2 (System of Linear Equations)

Solve the acoustic equations

$$p_t + K_o(x)u_x = 0 \quad (1)$$

$$\rho_o(x)u_t + p_x = 0 \quad (2)$$

$c_o(x) = \sqrt{(K_o(x)/\rho_o(x))}$  the speed of sound, using the fluctuation-signal algorithm/approach for a system of linear hyperbolic conservation laws with following initial data:

$$\begin{aligned} u(x, 0) &= 0 \quad \text{and} \quad p(x, 0) = \frac{1}{2}\exp(-80x^2) + S(x), \\ S(x) &= 0.5 \quad \text{if } -0.3 < x < -0.1 \quad \text{and} \quad 0 \quad \text{otherwise.} \\ \rho_o &= 1.0, K_o = \frac{1}{4}, \text{ domain } [-1, 1], 101 \text{ points.} \end{aligned}$$

Plot  $p(x)$  and  $u(x)$  at  $t = 0, 1, 2, 3$  for the following two cases:

1. Both ends of the domain are closed.
2. Both ends of the domain are open.