

Formulation of string wave

I. $u(x, t), \rho, T$: displacement, density and tension

Displacement is a function of space and time.

II. Governing equation: equation of motion

$$F = ma$$

$$T \frac{\partial u}{\partial x} \Big|_{x+\Delta x} - T \frac{\partial u}{\partial x} \Big|_x = \rho \Delta x \ddot{u}$$

$$u_{xx} = \frac{T}{\rho} u_{tt}$$

where

$$\frac{T}{\rho} = c^2$$

III. Initial condition:

$$u(x, 0) = f(x)$$

$$\dot{u}(x, 0) = g(x)$$

IV. Solution

$$u(x, t) = ?$$