

Project Report

one-dimensional heat conduction

1. Algorithm framework

In this project, the governing equation of one-dimensional heat conduction problem, the boundary conditions and the initial value can be expressed as

$$\rho c \frac{\partial u}{\partial t} - \kappa \frac{\partial^2 u}{\partial x^2} = f \quad \text{on } \Omega \times (0, T) \quad (1)$$

$$u = 0 \quad \text{on } \Gamma \times (0, T) \quad (2)$$

$$u|_{t=0} = u_0 = e^x \quad \text{in } \Omega. \quad (3)$$

Here, $\Omega := (0, 1)$ is the 1D domain. The boundary domain is $\Gamma = \{0, 1\}$. ρ , c , κ are the density, heat capacity and heat conductivity respectively. $f = \sin(\pi x)$ is the heat supply per unit volume.