Numerical Calculation of 1-d Dimensional Heat Equation

Taro Morita

May 31, 2021

Heat Equation

Explicit method

$$\frac{\partial \theta}{\partial t} = \kappa \frac{\partial^2 \theta}{\partial x^2} \tag{1}$$

Recurrence formula is ...

$$\frac{\theta_{i,j+1} - \theta_{i,j}}{\Delta t} = \kappa \frac{\theta_{i-1,j} - 2\theta_{i,j} + \theta_{i+1,j}}{(\Delta x)^2} \tag{2}$$

Transforming equation 2, we get

$$\theta_{i,J+i} = r\theta_{i-1,j} + (1-2r)\theta_{i,j} + r\theta_{i-1,j} \tag{3}$$

Where $r = \kappa \dfrac{\Delta t}{(\Delta x)^2}$

Heat equation

Explicit method

initial condition

boundary condition