

3D Time-Dependent Problems

PDEs:

$$\begin{aligned} C_{11} \frac{\partial U_1}{\partial t} + \dots + C_{1N} \frac{\partial U_N}{\partial t} &= F_1(x, y, z, t, U_1, U_{1x}, U_{1y}, U_{1z}, U_{1xx}, U_{1yy}, U_{1zz}, U_{1xy}, U_{1xz}, U_{1yz}, \dots) \\ &= \\ &= \\ C_{N1} \frac{\partial U_1}{\partial t} + \dots + C_{NN} \frac{\partial U_N}{\partial t} &= F_N(x, y, z, t, U_1, U_{1x}, U_{1y}, U_{1z}, U_{1xx}, U_{1yy}, U_{1zz}, U_{1xy}, U_{1xz}, U_{1yz}, \dots) \end{aligned}$$

where the C_{ij} are functions of $(x, y, z, t, U_1, \dots, U_N)$.

Boundary conditions:

$$\begin{aligned} G_1(x, y, z, t, U_1, U_{1x}, U_{1y}, U_{1z}, \dots, U_N, U_{Nx}, U_{Ny}, U_{Nz}) &= 0 \\ &= \\ &= \\ G_N(x, y, z, t, U_1, U_{1x}, U_{1y}, U_{1z}, \dots, U_N, U_{Nx}, U_{Ny}, U_{Nz}) &= 0 \end{aligned}$$

(periodic and "no" boundary conditions are also permitted)

Initial conditions:

$$\begin{aligned} U_1(x, y, z, t_0) &= U_{10}(x, y, z) \\ &= \\ &= \\ U_N(x, y, z, t_0) &= U_{N0}(x, y, z) \end{aligned}$$