

2D Steady-State Problems (Galerkin method)

PDEs:

$$\begin{aligned}
 & \frac{\partial A_1}{\partial x}(x, y, U_1, U_{1x}, U_{1y}, \dots, U_N, U_{Nx}, U_{Ny}) \\
 & + \frac{\partial B_1}{\partial y}(x, y, U_1, U_{1x}, U_{1y}, \dots, U_N, U_{Nx}, U_{Ny}) = F_1(x, y, U_1, U_{1x}, U_{1y}, \dots, U_N, U_{Nx}, U_{Ny}) \\
 & = \\
 & = \\
 & \frac{\partial A_N}{\partial x}(x, y, U_1, U_{1x}, U_{1y}, \dots, U_N, U_{Nx}, U_{Ny}) \\
 & + \frac{\partial B_N}{\partial y}(x, y, U_1, U_{1x}, U_{1y}, \dots, U_N, U_{Nx}, U_{Ny}) = F_N(x, y, U_1, U_{1x}, U_{1y}, \dots, U_N, U_{Nx}, U_{Ny})
 \end{aligned}$$

Boundary conditions:

$$\begin{aligned}
 U_1 &= FB_1(x, y) \\
 &= \\
 &= \\
 U_N &= FB_N(x, y)
 \end{aligned}$$

or

$$\begin{aligned}
 A_1 N_x + B_1 N_y &= GB_1(x, y, U_1, U_{1x}, U_{1y}, \dots, U_N, U_{Nx}, U_{Ny}) \\
 &= \\
 &= \\
 A_N N_x + B_N N_y &= GB_N(x, y, U_1, U_{1x}, U_{1y}, \dots, U_N, U_{Nx}, U_{Ny})
 \end{aligned}$$

where $(N_x, N_y) =$ unit outward normal vector.