Plates: plane load

inner space orientation
dual time intervals

outer space orientation
primal time intervals

displacement $1\overline{\mathbf{P}}$ u_x, u_y

$$\varepsilon_x = \partial_x u_x$$
$$\varepsilon_y = \partial_y u_y$$
$$\gamma_{xy} = \partial_y u_x + \partial_x u_y$$

strain $2\overline{\mathbf{L}}$ $\varepsilon_x, \varepsilon_y, \gamma_{xy}$

$$\partial_{yy}\varepsilon_x + \partial_{xx}\varepsilon_y - \partial_{xy}\gamma_{xy} = 0$$

incompatibility function $1\overline{\mathbf{S}}$ 0

displacement method

$$\begin{Bmatrix} \varepsilon_x \\ \varepsilon_y \\ \gamma_{xy} \end{Bmatrix} = \frac{1}{Eh} \begin{bmatrix} 1 & -\nu & 0 \\ -\nu & 1 & 0 \\ 0 & 0 & 2(1+\nu) \end{bmatrix} \begin{Bmatrix} N_x \\ N_y \\ N_{xy} \end{Bmatrix}$$

Airy $\nabla^4 \chi(x, y) = 0$

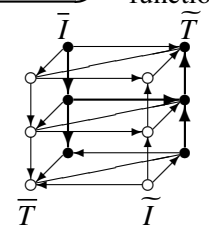
force method

force/area $1\widetilde{\mathbf{V}}$ f_x, f_y

$$-\left(\partial_x N_x + \partial_y N_{xy}\right) = f_x$$
$$-\left(\partial_x N_{xy} + \partial_y N_y\right) = f_y$$

stress resultant $2\widetilde{\mathbf{S}}$ N_x, N_y, N_{xy}

$$N_x = \partial_{yy}\chi$$
$$N_y = \partial_{xx}\chi$$
$$N_{xy} = -\partial_{xy}\chi$$

Airy function $1\widetilde{\mathbf{L}}$ χ

u_x, u_y	*displacement*
$\varepsilon_x, \varepsilon_y, \gamma_{xy}$	*strain*
f_x, f_y	*surface force*
N_x, N_y, N_{xy}	*axial forse*
χ	*Airy stress function*
E	*elastic modulus*
h	*thickness*