MES – Macierz H lokalna

$$[H]=\int_V k(t)\left(\left\{\frac{\partial\{N\}}{\partial x}\right\}\left\{\frac{\partial\{N\}}{\partial x}\right\}^T+\left\{\frac{\partial\{N\}}{\partial y}\right\}\left\{\frac{\partial\{N\}}{\partial y}\right\}^T\right)dV$$

$$\begin{bmatrix}\dfrac{\partial N_i}{\partial x}\\[2mm] \dfrac{\partial N_i}{\partial y}\end{bmatrix}=\frac{1}{\det[J]}\begin{bmatrix}\dfrac{\partial y}{\partial \eta} & -\dfrac{\partial y}{\partial \xi}\\[2mm] -\dfrac{\partial x}{\partial \eta} & \dfrac{\partial x}{\partial \xi}\end{bmatrix}\begin{bmatrix}\dfrac{\partial N_i}{\partial \xi}\\[2mm] \dfrac{\partial N_i}{\partial \eta}\end{bmatrix}$$

$$\frac{\partial N_1}{\partial \xi}=-\frac{1}{4}(1-\eta)\quad \frac{\partial N_2}{\partial \xi}=\frac{1}{4}(1-\eta)\quad \frac{\partial N_3}{\partial \xi}=\frac{1}{4}(1+\eta)\quad \frac{\partial N_4}{\partial \xi}=-\frac{1}{4}(1+\eta)_4$$

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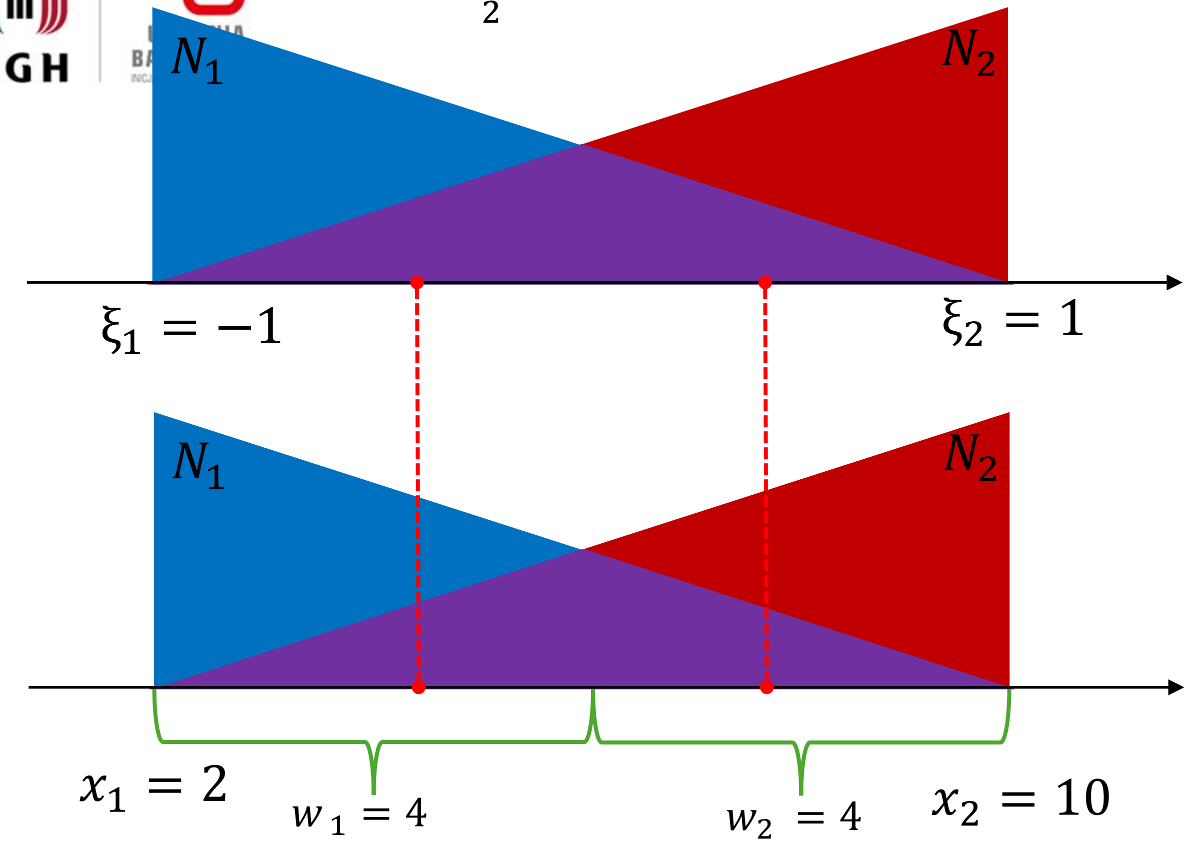
$$\frac{\partial x}{\partial \xi}=\frac{\partial N_1}{\partial \xi}x_1+\frac{\partial N_2}{\partial \xi}x_2+\frac{\partial N_3}{\partial \xi}x_3+\frac{\partial N_4}{\partial \xi}x_4=\frac{1}{4}(\eta-1)x_1+\frac{1}{4}(1-\eta)x_2+\frac{1}{4}(1+\eta)x_3-\frac{1}{4}(1+\eta)x_4$$

$$\frac{\partial x}{\partial \xi}=\frac{\eta}{4}x_1-\frac{1}{4}x_1+\frac{1}{4}x_2-\frac{\eta}{4}x_2+\frac{1}{4}x_3+\frac{\eta}{4}x_3-\frac{1}{4}x_4-\frac{\eta}{4}x_4=\frac{\eta}{4}(x_1-x_2+x_3-x_4)+\frac{1}{4}(-x_1+x_2+x_3-x_4)$$

$$[H]=\int_V k(t)\left(\left\{\frac{\partial\{N\}}{\partial x}\right\}\left\{\frac{\partial\{N\}}{\partial x}\right\}^T+\left\{\frac{\partial\{N\}}{\partial y}\right\}\left\{\frac{\partial\{N\}}{\partial y}\right\}^T\right)dV$$

	$\frac{\partial N_1}{\partial x}$	$\frac{\partial N_2}{\partial x}$	$\frac{\partial N_3}{\partial x}$	$\frac{\partial N_4}{\partial x}$
$\frac{\partial N_1}{\partial x}$				
$\frac{\partial N_2}{\partial x}$				
$\frac{\partial N_3}{\partial x}$				
$\frac{\partial N_4}{\partial x}$				

$$\int_{2}^{10} f(x)dx = ?$$



$$x_{pc1} = N_1 x_1 + N_2\, x_2 = 0.788 * 2 + 0.212 * 10 = 3.696$$

$$x_{pc2} = N_1 x_1 + N_2\, x_2 = 0.212 * 2 + 0.788 * 10 = 8.304$$

$$N_1 = \frac{x_2 - x}{x_2 - x_1} = \begin{vmatrix} x_1 = -1 \\ x_2 = 1 \end{vmatrix} = \frac{1 - x}{1 - (-1)} = \frac{1}{2}(1 - x)$$

$$N_2 = \frac{x - x_1}{x_2 - x_1} = \begin{vmatrix} x_1 = -1 \\ x_2 = 1 \end{vmatrix} = \frac{x - (-1)}{1 - (-1)} = \frac{1}{2}(1 + x)$$

$$N_1(-0.577) = \frac{1}{2}\big(1 - (-0.577)\big) = 0.788$$

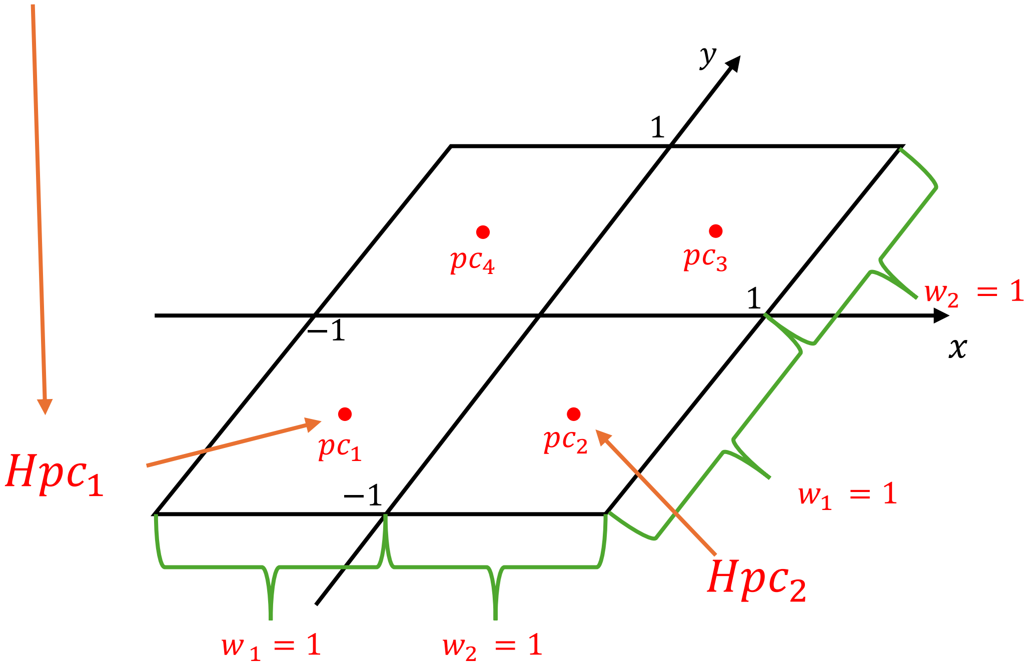
$$N_2(-0.577) = \frac{1}{2}\big(1 + (-0.577)\big) = 0.212$$

$$detJ = \frac{\partial x}{\partial \xi} = \frac{\Delta x}{\Delta \xi} = \frac{x_2 - x_1}{\xi_2 - \xi_1} = \frac{10 - 2}{1 - (-1)} = 4$$

$$\int_{2}^{10} f(x)dx = \big(f(x_{pc1}) * w_1 + f(x_{pc2}) * w_2\big) * detJ$$

$$\int_{2}^{10} (2x^2 + 0.1x + 3)dx = ?$$

$$k(t)\left(\left\{\frac{\partial\{N\}}{\partial x}\right\}\left\{\frac{\partial\{N\}}{\partial x}\right\}^T+\left\{\frac{\partial\{N\}}{\partial y}\right\}\left\{\frac{\partial\{N\}}{\partial y}\right\}^T\right)detJ$$



$$[H] = (Hpc_1 * w_1 w_1 + Hpc_2 * w_2 w_1 + \\ + Hpc_3 * w_2 w_2 + Hpc_4 * w_1\, w_2)$$

Praca domowa

- Dodanie możliwości wczytywania współrzędnych węzłów z pliku.
- Napisanie funkcji liczącej macierz H lokalną.
- Zadanie jest uznane za zrobione jeżeli program zwraca wyniki zgodne z testami na UPEL.