

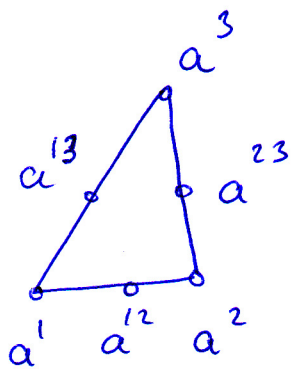
Continuous p.w. quadratic interpolation in 2D

(7)

$$V_h = \{v: v \text{ cont. in } \Omega, v \in \mathcal{P}^2(K), K \in \mathcal{T}_h\}$$

$$\mathcal{P}^2(K) = \left\{ v: v(x) = \sum_{0 \leq i+j \leq 2} c_{ij} x_1^i x_2^j \text{ for } x = (x_1, x_2) \in K, c_{ij} \in \mathbb{R} \right\}$$

$$\dim(\mathcal{P}^2(K)) = 6 \quad (c_{00}, c_{10}, c_{01}, c_{20}, c_{11}, c_{02})$$



Element nodes a^1, \dots, a^{23}

element nodal basis functions $\{\psi_i\}_{i=1}^6$ for $\mathcal{P}^2(K)$ are given as combinations of the linear basis functions $\lambda_1, \lambda_2, \lambda_3$:

$$\psi_1 = \lambda_1(2\lambda_1 - 1), \quad \psi_2 = \lambda_2(2\lambda_2 - 1), \quad \psi_3 = \lambda_3(2\lambda_3 - 1)$$

$$\psi_4 = 4\lambda_1\lambda_2, \quad \psi_5 = 4\lambda_1\lambda_3, \quad \psi_6 = 4\lambda_2\lambda_3$$

$$\Rightarrow v(x) = \sum_{i=1}^6 \varrho_i \psi_i \quad \left(\begin{array}{l} \varrho_i = v(a^i) \quad i=1,2,3 \\ \varrho_k = v(a^{ij}) \quad 1 \leq i < j \leq 3 \\ \quad \quad \quad k=4,5,6 \end{array} \right)$$

Interpolation error:

$$\|u - \pi_h u\| \leq C_i \|h^3 D^3 u\|$$

$\pi_h u \in V_h$ interpolates u in all nodes