Institut für Numerische Simulation
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Computer lab
Numerical Methods for Thin Elastic Sheets

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Problem sheet 4 June 10th, 2013

Tasks:

(i) Compute

$$\varepsilon[\theta_h] = \begin{pmatrix} \theta^1_{h,x} \\ \theta^2_{h,y} \\ \theta^1_{h,y} + \theta^2_{h,x} \end{pmatrix}$$

where

$$\theta_h(w_h)(\mathbf{x}(\xi,\eta))|_T = \begin{pmatrix} H_x(\xi,\eta)^T U \\ H_y(\xi,\eta)^T U \end{pmatrix}$$

as given as on labsheet 3 and

$$\theta^j_{h,x} = \frac{\partial \theta^j_h(w_h)(\mathbf{x}(\xi,\eta))}{\partial x},$$

where $\mathbf{x}(\xi,\eta) = \begin{pmatrix} x(\xi,\eta) \\ y(\xi,\eta) \end{pmatrix}$ and $j = 1,2$.

Mind: $\mathbf{x}(\xi,\eta)$ *represents the global position and* $\theta^1_{h,x}, \ldots$ *denote the derivative with respect to this global coordinate. This has to be expressed in local coordinates first.*

(ii) Implement this in *labsheetTemplates/labsheet4/DKTFE.h*, i.e., the function `evaluateGradient` should return a `Vec3<DataType>` given by $\varepsilon[\theta_h]$.