Vector Mean Curvature of an Ellipsoid

a `deal.ii` implementation

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Let $S \subset \mathbb{R}^{d+1}$ be a closed, codimension-1 surface, and let $\mathbf{x}_S : \hat{S} \to S$ be a parameterization of S from the parameteric domain $\hat{S} \subset \mathbb{R}^d$.

For concreteness, let $d = 2$ and put $\hat{S} := [0, 2\pi] \times [0, \pi]$, and $\mathbf{x}_S := (a \sin\phi \cos\theta, b \sin\phi \sin\theta, c \cos\phi)$.

$\mathbf{id}_S : S \to S \subset \mathbb{R}^3$ Need to think about $\mathbf{id}_S$ acting on quadrature points $p_\ell \in \hat{K}$, so $\mathbf{id}_S(p_\ell) := \mathbf{id}_S(\mathbf{x}_K(p_\ell))$

`https://www.dealii.org/8.4.1/doxygen/deal.II/group__UpdateFlags.html`

$$\sum_{\ell=1}^{N} \left(\nabla_K \boldsymbol{\phi}_i(p_\ell) \,:\, \nabla_K \mathbf{id}_K(p_\ell)\right) \, J \times W(p_\ell) \tag{1}$$

$$\Delta\, \mathbf{id}_S = h\boldsymbol{\nu} =: \mathbf{h} \tag{2}$$

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