

Trellis

Users Manual
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Class StrainTensor3d

Class description:

The class StrainTensor3d provides strain tensors for a three dimensional analysis. The following strain tensors are computed:

- The deformation gradient $\mathbf{F} = \mathbf{I} + \nabla \mathbf{u}$
- The right Cauchy Green tensor $\mathbf{C} = \mathbf{F}^T \mathbf{F}$
- The Green Strain tensor $\mathbf{E} = \frac{1}{2}(\mathbf{F}^T \mathbf{F} - \mathbf{I}) = \frac{1}{2}(\mathbf{C} - \mathbf{I})$
- The left Cauchy Green tensor (= finger tensor) $\mathbf{b} = \mathbf{F} \mathbf{F}^T$
- The right stretch tensor $\mathbf{U} = \sqrt{\mathbf{C}}$
- The left stretch tensor $\mathbf{V} = \sqrt{\mathbf{b}}$

where \mathbf{u} denotes the displacement field, and \mathbf{I} is the second order unity tensor.

Interface description:

```
// CREATOR
```

```
StrainTensor3d(const Interpolation3d<DofVector> &, const SPoint3 &);
```

```
// ACCESSORS
```

```
const FMatrix<3,3> &F(); // return the deformation Gradient  $\mathbf{F} = \mathbf{1} + \text{Grad}(\mathbf{u})$ 
```

```
const FMatrix<3,3> &C(); // return the right Cauchy Green Tensor  $\mathbf{C} = \mathbf{F}^T * \mathbf{F}$ 
```

```
const FMatrix<3,3> &E(); // return the GreenStrainTensor  $\mathbf{E} = 0.5 * \mathbf{C} - \mathbf{1}$ 
```

```
const FMatrix<3,3> &b(); // return the left Cauchy Green Tensor  $\mathbf{b} = \mathbf{F} * \mathbf{F}^T$ 
```

```
const FMatrix<3,3> &U(); // return the right stretch tensor  $\mathbf{U} = \text{sqrt}(\mathbf{C})$ 
```

```
const FMatrix<3,3> &V(); // return the left stretch tensor  $\mathbf{V} = \text{sqrt}(\mathbf{b})$ 
```