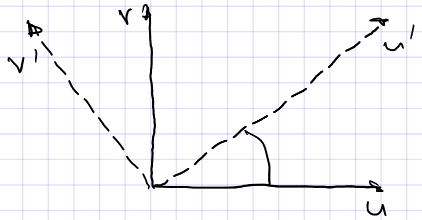

$\vec{u}' = R\vec{u}$

$\vec{v}' = R\vec{v}$

$\vec{v} = T\vec{u} \longrightarrow \vec{v}' = T'\vec{u}'$

$\underbrace{R^{-1}R}_{I}\vec{v} = R^{-1}T'R\vec{u}$

$\vec{v} = R^{-1}T'R\vec{u}$

$\vec{v} = R^{T}T'R\vec{u}$

$T = R^T T' R$

$\boxed{T' = R T R^T}$

$$\sigma' = R\sigma R^T = \begin{bmatrix} \sigma_I & 0 & 0 \\ 0 & \sigma_{II} & 0 \\ 0 & 0 & \sigma_{III} \end{bmatrix}$$

$\sigma_I > \sigma_{II} > \sigma_{III}$

$\det(\sigma - \lambda I) = 0$

$\lambda_1, \lambda_2, \lambda_3$

$A = Q \Lambda Q^T$

$$\Lambda = \begin{bmatrix} \lambda_1 & & 0 \\ & \lambda_2 & \\ 0 & & \lambda_3 \end{bmatrix}$$

$(\sigma - \lambda_1 I)\vec{v}_1 = \vec{0}$

$(\sigma - \lambda_2 I)\vec{v}_2 = \vec{0}$

$(\sigma - \lambda_3 I)\vec{v}_3 = \vec{0}$

$$R = \left[\frac{\vec{v}_1}{\|v_1\|}, \frac{\vec{v}_2}{\|v_2\|}, \frac{\vec{v}_3}{\|v_3\|}\right]$$

$-\lambda^3 + I_1\lambda^2 + I_2\lambda + I_3 = 0 \leftarrow$ characteristic equation

I_1, I_2, I_3 are invariants of the stress tensor

$I_1 = tr(\sigma) = \sigma_{ii} = \overbrace{\sigma_I + \sigma_{II} + \sigma_{III}}^{3p}$

$I_2 = \frac{1}{2}\sigma_{ij}\sigma_{ij} - \frac{1}{2}I_1^2$

$= -(\sigma_I\sigma_{II} + \sigma_I\sigma_{III} + \sigma_{II}\sigma_{III})$

$I_3 = \det(\sigma) = \sigma_I\sigma_{II}\sigma_{III}$

$\rho\ddot{u} = \nabla\cdot\sigma + \rho\vec{b}$

$\sigma \Rightarrow f(u)$

"constitutive model"

$\sigma = E\varepsilon$

$= E\left(\frac{\partial u}{\partial x}\right)$

$$\sigma_{ij} = \underbrace{\overbrace{-\frac{1}{3}\sigma_{kk}\delta_{ij}}^{\text{pressure}}}_{\substack{\text{spherical} \\ \text{hydrostratic} \\ \text{dilational}}} + \underbrace{S_{ij}}_{\text{deviatoric stress}}$$

$$U = \begin{bmatrix} x & x & x \\ 0 & x & x \\ 0 & 0 & x \end{bmatrix}$$

$A = LU$

Invariants of deviatic stress

$J_1 = 0$

$J_2 = \frac{1}{2} S_{ij} S_{ij}$

$J_3 = \det(S)$