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$Reference\ load\ vector: [\bar{\boldsymbol{P}}]$

$First\ load\ increment: \boldsymbol{\lambda_1^1}$

$Maximum\ load\ increment: \boldsymbol{\lambda_{max}}$

$Residual\ load\ vector: [\boldsymbol{R}] = [\boldsymbol{0}]$

$Total\ load\ increment: \boldsymbol{\lambda} = \boldsymbol{0}$

$Total\ displacement: \boldsymbol{U} = \boldsymbol{0}$

$Total\ iteration: \boldsymbol{i_{total}} = \boldsymbol{1}$

$Tolerance: \boldsymbol{tol} = \boldsymbol{10^{-4}}$

$while\ \lambda < \lambda_{max}$

$conv = 1$

$inc = 1$

$while\ conv > tol$

$Existing\ geometry: \boldsymbol{{}^1E},\ \boldsymbol{{}^1L},\ {}^1\Theta,\ \boldsymbol{F_1},\ \boldsymbol{du},\ \boldsymbol{dv}$

$Local\ stiffness\ matrix: [k] = [k_e] + [k_g] + [k_1] + [k_2] + [k_3]$

$Global\ stiffness\ matrix: [K] = [T({}^1\Theta)]^T \cdot [k] \cdot [T({}^1\Theta)]$

$\delta\hat{U} = [K]^{-1} \cdot [\bar{P}]$

$\delta\bar{U} = [K]^{-1} \cdot [R]$

First iteration of a load step (predictor):

$if\ i_{total} = 1$

$\delta\lambda = \lambda_1^1$

$\delta\hat{U}_1^1 = \delta\hat{U}$

$\delta\hat{U}_1^{i-1} = \delta\hat{U}$

$\delta\hat{U}^{hist} = \delta\hat{U}$

$\lambda^{hist} = \delta\lambda$

$elseif\ \ inc = 1\ \&\ i_{total} \neq 1$

$GSP = \frac{\delta\hat{U}_1^1 \cdot \delta\hat{U}_1^1}{\delta\hat{U}_1^{i-1} \cdot \delta\hat{U}}$

$sign_{GSP} = sgn(GSP)$

$sign_{\lambda} = sgn(\lambda_1^{i-1})$

$\delta\lambda = (sign_{GSP})\ (sign_{\lambda})\ \lambda_1^1\ |GSP|^{0.5}$

$\delta\hat{U}^{hist} = \delta\hat{U}$

$\lambda^{hist} = \delta\lambda$

end

Remaining iterations of a load step (corrector):

$if\ inc > 1$

$\delta\lambda = -\frac{\delta\hat{U}_1^{i-1} \cdot \delta\bar{U}}{\delta\hat{U}_1^{i-1} \cdot \delta\hat{U}}$

end

Global solution update:

$\delta U = \delta\bar{U} + \delta\lambda \cdot \delta\hat{U}$

$U = U + \delta U$

$\lambda = \lambda + \delta\lambda$

Geometry update for each element (i):

$u_i^G = \delta U_i$

$u_i^L = [T({}^1\Theta)]_i \cdot u_i^G$

$Obtain\ \ du\ \ \&\ \ dv\ \ from\ \ u_i^L$

$x_i = x_i + u_{x,i}^G$

$y_i = y_i + u_{y,i}^G$

${}^2\Theta = \pm arctan\left(\frac{y_2 - y_1}{x_2 - x_1}\right)$

${}^2L = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$

$F_2 = \left[{}^1EA\left(\frac{\Delta u}{{}^1L} + \frac{1}{2}\left\{\left(\frac{\Delta u}{{}^1L}\right)^2 + \left(\frac{\Delta v}{{}^1L}\right)^2\right\}\right) + F_1\right]\frac{{}^2L}{{}^1L}$

${}^2E = E_0\left(\frac{{}^2L}{{}^0L}\right)^3$

$[{}^2f]^T = [-F_2 \quad 0 \quad F_2 \quad 0]$

$[{}^2F] = [T({}^2\Theta)]^T \cdot [{}^2f]$

Convergence:

$Total\ resisting\ global\ force\ vector: [F_r] = \sum[{}^2F]_i$

$[F_e] = \lambda \cdot [\bar{P}]$

$[R] = [F_e] - [F_r]$

$conv = \frac{\|R\|}{\|F_e\|}$

$inc = inc + 1$

$i_{total} = i_{total} + 1$

end

Update history variables:

$\delta\hat{U}_1^{i-1} = \delta\hat{U}^{hist}$

$\lambda_1^{i-1} = \lambda^{hist}$

end