$$* \ \text{Arclength}(\text{data}, \underline{u^n}, \underline{\lambda^n}) \longrightarrow \underline{(u^{n+1}, \lambda^{n+1})}$$

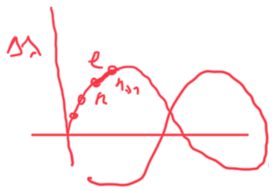
k_{max} = data.maxiter = 100

ε = data.epsilon = $1 \cdot 10^{-5}$

ℓ = data.ℓ = 0.1

ψ = data.psi = 0 (Hypercylindrical)

q = data.forces $(N \times 1)$



$K_T(u^n)$

$$K_T V^n = q \xrightarrow{c.c.} V^n = \text{solveLS}(K_T, q, cc)$$

Predicción $(k=0)$:

$$\Delta\lambda_k = \underbrace{\text{sgn}(q^T V^n)}_{\text{Criterio trabajo externo positivo.}} \frac{\ell}{(V^{nT} V^n + \psi^2 q^T q)^{1/2}}$$

$$\Delta u_k = V^n \Delta\lambda_k$$

$$\left.\begin{array}{l} u_k = u^n + \Delta u_k \\ \lambda_k = \lambda^n + \Delta\lambda_k \end{array}\right| \rightarrow \text{Solución del problema}$$

P_k = assembleP(data, u_k)

$r_k = P_k - \lambda_k q$

r_k(data.fixed_dofs) = 0

$r_0 = \|r_k\|$, normrk $= r_0$

Corrección $(k = 1, 2, \ldots n)$:

$C_k = 0$ (Valor de la restricción)

$k = 1$ (contador iteración)

while ($k \leq k_{max}$ && $normr_k / r_0 > \varepsilon$)

Imprimir número subiteración

$K_T(u_k)$

$K_T Y = q \xrightarrow{c.c.} Y = solveLS(K_T, q, cc$

$K_T X = r_k \xrightarrow{c.c} X = solveLS(K_T, r_k, cc$

$$\eta_k = \frac{-c_k + 2\Delta u_k^T X}{2\Delta u_k^T Y + 2\Delta\lambda_k \psi^2 q^T q}$$

$d_k = -X + \eta_k Y$

$\Delta u_k = \Delta u_k + d_k$

$\Delta\lambda_k = \Delta\lambda_k + \eta_k$

$c_k = \Delta u_k^T \Delta u_k + \Delta\lambda_k^2 \psi^2 q^T q - \ell^2$

$u_k = u_k + d_k$

$\lambda_k = \lambda_k + \eta_k$

$P_k = assembleP(data, u_k)$

$r_k = P_k - \lambda_k q$

$r_k(data.fixed\_dofs) = 0$

$normr_k = \| r_k \|$

$k = k + 1$

end

Imprimir residuo

$\psi \neq 0 \qquad \Delta u^T \Delta u + \Delta\lambda^2 \psi^2 \underline{\underline{q^T q}} - \ell^2 = 0$

$$\underline{\ell} = \sqrt{\|\Delta u\|^2 + \Delta\lambda^2 \underline{\psi}^2 q^T q}$$