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function [tau,tauDER1,tauDER2] = tauFUN_1paramELASTplast(qL,DATA)
if nargin == 0
    load('tmp1.mat')
end
%-----
% This is an adaptation of tauFUN_1paramVECT to deal with elastoplastic
% problems in small strains.
% Here qL = [qELAST; qPLAST]
% tau is of the form
% tau = [qL_1,qL_2,g(qL_2)]... This is a 1 x nEXTEND matrix
% such that
% dL = Phi*tau ... (N x 1) = (N x n_extend) * (n_extend x 1)
% Regarding the derivatives, we have that (for a single value of qL \in \R^n{2})
% d {dL}/d {qL} is a N x 2 matrix
% This implies that
% d tau/ d qL is a (n_extend x 2) matrix
% The first row is {d tau/ d qL}(1,:) = [1, zeros(1,n_extend-1)]
% The second row is {d tau/ d qL}(1,:) = [0,1, dg/dqL_2]
% And what about the 2nd derivative ?
%

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According to ChatGPT

<https://chatgpt.com/share/689b6018-dd14-8013-b9f2-efa7923077f5>

Thought for 25s

Short answer (with two generalized coordinates $q = (q_1, q_2)$):

- $d(q) \in \mathbb{R}^N$.
- First derivative (Jacobian):

$$\frac{\partial d}{\partial q}(q) = \Phi \frac{\partial \tau}{\partial q}(q) \in \mathbb{R}^{N \times 2}.$$

Equivalently, two N -vectors $\partial d / \partial q_1$ and $\partial d / \partial q_2$.

- Second derivative (componentwise Hessians):

$$\frac{\partial^2 d}{\partial q \partial q^\top}(q) = \Phi \frac{\partial^2 \tau}{\partial q \partial q^\top}(q) \in \mathbb{R}^{N \times 2 \times 2}.$$

For each $i = 1, \dots, N$, the Hessian of d_i is a 2×2 symmetric matrix.

If you store only unique entries (Voigt packing), that becomes an $N \times 3$ array with entries $(q_1 q_1, q_1 q_2, q_2 q_2)$.

(Here $\Phi \in \mathbb{R}^{N \times m}$, $\tau : \mathbb{R}^2 \rightarrow \mathbb{R}^m$, so $\partial \tau / \partial q \in \mathbb{R}^{m \times 2}$ and $\partial^2 \tau / \partial q \partial q^\top \in \mathbb{R}^{m \times 2 \times 2}$.)