Code verification

Method of Manufactured Solution - MMS

The bone curve of MPII model contains abs() operator, making it hard to construct theoretical solutions from MMS. Therefore, to verify the nonlinear code, a simpler nonlinear constitutive relation between stress and strain is applied:

$$\tau = G_0 \gamma \left(1 + \left(\frac{\gamma}{\gamma_0} \right)^2 \right)$$

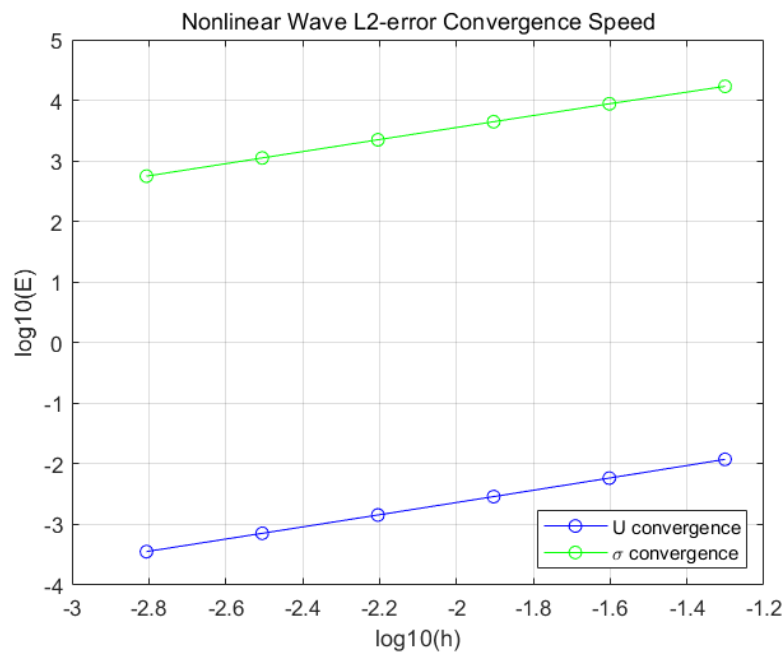The displacement solution is constructed to be:

$$u := \frac{t^2 \; x_0 \left(1 - \frac{x_0^2 \; t}{L} \right)}{L}$$

And the corresponding source term is

$$f = \frac{2 \left(L^5 \; eps0^2 \; \rho + 3 \; t \; eps0^2 \left(G0 \; t^2 - \rho \; x_0^2 \right) L^4 + 9 \; G0 \; L^2 \; t^7 - 54 \; G0 \; L \; t^8 \; x_0^2 + 81 \; G0 \; t^9 \; x_0^4 \right) x_0}{eps0^2 \; L^6}$$

➢ Convergence study:

Displacement:

Order of accuracy: **1.0109**
Correlation coefficient: 1.0000

Stress:

Order of accuracy: **0.9863**
Correlation coefficient: 1.0000