Stability of strain gradient elastic bars in tension

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Published online: 21 March 2008
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Erratum to: Optimization Letters (2007) 1:407–420
DOI:10.1007/s11590-006-0039-9

The error appears in the value of ω defined by Eq. (33a) of the text. In fact with the selected values of c_1, c_2, c_3 , ω is not real. Hence the values of c_1, c_2, c_3 should be changed and the section of “Application” should be modified. The corrected part follows.

8 Application

Implementing the proposed theory, we consider an application with the second gradient unidirectional elastic moduli,

$$c_1 = -6.75 \times 10^{-2} \text{cm}^2, \quad c_2 = 1.0 \times 10^{-3} \text{cm}^4, \quad c_3 = -1 \times 10^{-3} \text{cm}^2.$$

The critical load defined by Eq. (33b) has been found equal to $p_o = 1.07133$ and the mode number $\omega = 57.21 \text{ cm}^2$ computed by Eq. (33a). Further, the large homogeneous displacement parameter $\alpha_o = 0.08$ may be defined through Eq. (19). Likewise, the critical first Piola stress $\sigma_o = 0.09$ is computed recalling Eq. (11). The application

The online version of the original article can be found under doi:[10.1007/s11590-006-0039-9](https://doi.org/10.1007/s11590-006-0039-9).

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Fig. 2 The strain localization for the application

is performed with the incremental loading parameter $\gamma = 5$, see Eq. (12). For the present problem Eq. (41) becomes,

$$\frac{\partial A_R(X)}{\partial X} = \left(1.043 \times 10^4 A_R^2(X) - 1.945 \times 10^6 A_R^4(X) \right)^{1/2}. \quad (43)$$

Inversing Eq. (43) and integrating we get, $X = 30491(3.21 \times 10^{-7}(\text{Log}[A^2] - \text{Log}[9.66 \times 10^{12}A + 3.17 \times 10^6 \sqrt{9.66 \times 10^{12}A^2 - 9.02 \times 10^{14}A^4}]))$ for $0 < A < 0.073$. The region of integration is defined by Eq. (40), recalling the strain is maximum at the middle of the bar.

The localization of the strain is presented in Fig. 2.