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Corrigendum to "Constitutive sensitivity of the oscillatory behaviour of hyperelastic cylindrical shells" [J. Sound Vib. 358 (2015) 199–216]

D. Aranda-Iglesias, G. Vadillo, J.A. Rodríguez-Martínez*

Department of Continuum Mechanics and Structural Analysis, University Carlos III of Madrid, Avda. de la Universidad 30, 28911 Leganés, Madrid, Spain

An error has been found in Eq. (25) of the recently published paper [1] and the authors wish to correct the record by means of this corrigendum. The corrected expression is:

$$F(\lambda_i) = \frac{\left(\lambda_i^2 - 1\right)}{2C_{M1}}\left(2(C_{Y1} - 2C_{Y2} + 6C_{Y3})\ln\left(\frac{\mu + 1}{\mu/\lambda_i^2 + 1}\right) + (\lambda_i^2 - 1)\left(-\frac{2(C_{Y2} - 3C_{Y3})}{\mu + 1} - \frac{2(C_{Y2} - 3C_{Y3})}{\mu + \lambda_i^2} + \frac{(\lambda_i^2 + 1)(2\lambda_i^2(C_{Y2} - 4C_{Y3}) + C_{Y3}\lambda_i^4 + C_{Y3})}{\lambda_i^4} + \frac{C_{Y3} - C_{Y3}\lambda_i^2}{(\mu + 1)^2} + \frac{C_{Y3}(\lambda_i^2 - 1)}{(\mu + \lambda_i^2)^2}\right)\right) \tag{1}$$

While the main conclusions of the paper regarding the constitutive sensitivity of the oscillatory behaviour of the cylindrical shell remain valid, the results reported for the Yeoh material have to be corrected. The updated graphs with some brief explanatory notes which focus on the revised Yeoh behaviour can be found below. We have included the original numbering of the figures to facilitate the reader when comparing this corrigendum with the paper to which it refers [1].

1. Free oscillations

Fig. 1(a) shows that the $F(\lambda_i) - \lambda_i$ curve for the Yeoh material has a concave-up shape. The closed orbits in the phase plane of Fig. 1(b) indicate that the behaviour of the shell is oscillatory no matter the value of the initial conditions parameter C. As such, Fig. 3 in [1] is not necessary. This is the main difference with respect to the results we originally reported in our paper.

Fig. 2(a) shows that the T versus C curve corresponding to the Yeoh material actually shows a relative minimum and a relative maximum denoted as T_{min} and T_{max}, respectively. Values of C larger than that corresponding to T_{max} lead to a continuous decrease in the period of the oscillations. The evolution of the relative maximum and minimum periods with the thickness parameter μ is given in Fig. 2(b). We observe that both T_{max} and T_{min} run above the minimum period of the oscillation obtained for the Mooney-Rivlin material for all the values of the parameter μ investigated.

Fig. 3 shows that, with the correction of Eq. (25) in [1], in agreement with the results presented in Fig. 1, the response of the circumferential stretch in the inner surface of the shell obtained for the Yeoh material is oscillatory, no matter the value of C.

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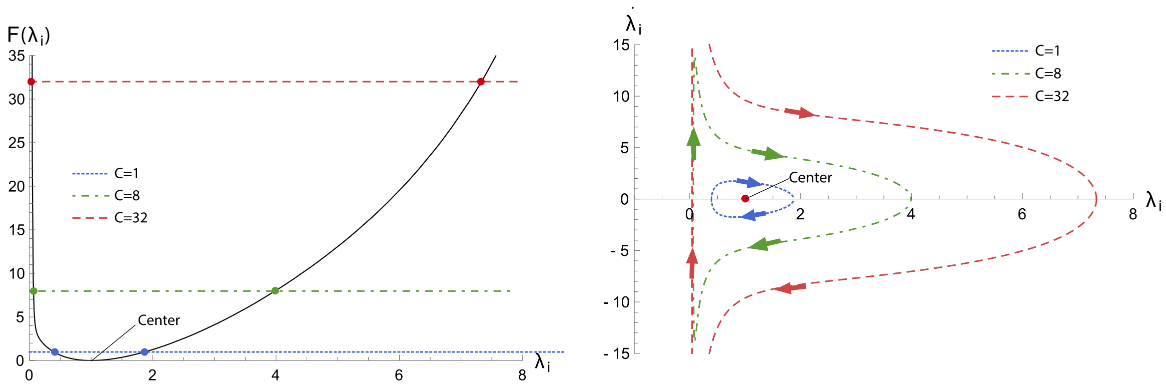
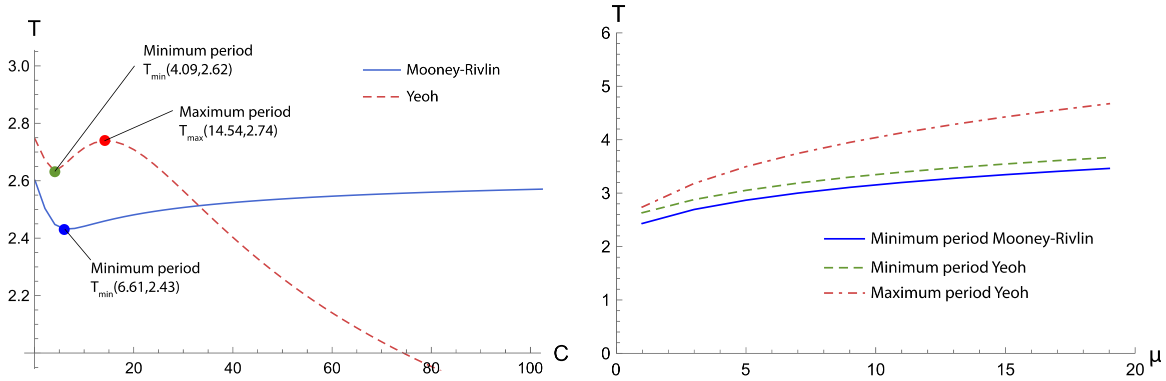
* Corresponding author.
E-mail address: jarmarti@ing.uc3m.es (J.A. Rodríguez-Martínez).



(a) Figure 2a in [1]

(b) Figure 2b in [1]

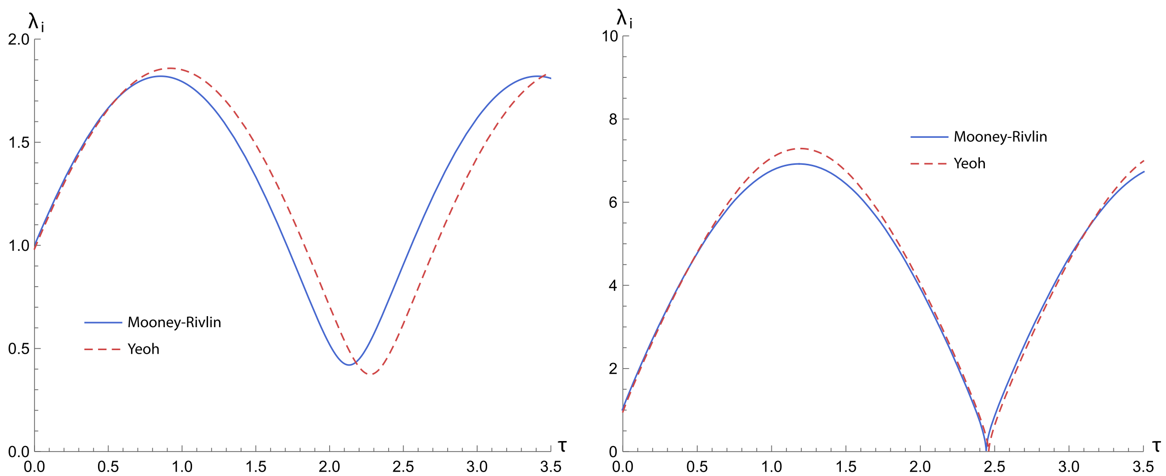
Fig. 1. Free oscillations. Yeoh constitutive model. The thickness parameter is $\mu=1$. Three values of the initial conditions parameter are investigated: C=1, C=8 and C=32. (a) Elastic stored energy F (λ_i) versus stretch λ_i. (b) Phase diagram, $\dot{\lambda}_i$ versus λ_i.



(a) Figure 4 in [1]

(b) Figure 5 in [1]

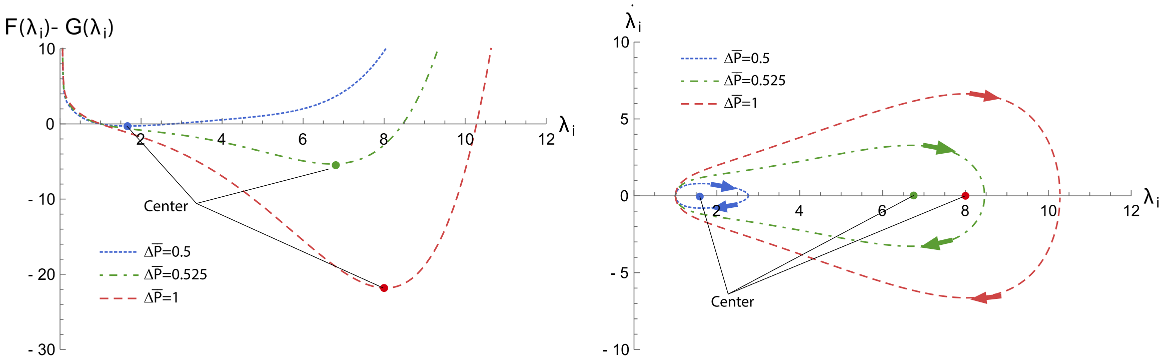
Fig. 2. Free oscillations. (a) Period of the oscillation T versus the initial conditions parameter C for Mooney-Rivlin (solid line) and Yeoh (dashed line) constitutive models. The reference value $\mu=1$ is taken. (b) Relative maximum and minimum periods, T_{max} and T_{min}, versus the geometrical parameter μ for Mooney-Rivlin (solid line) and Yeoh (dashed lines) constitutive models.



(a) Figure 6a in [1]

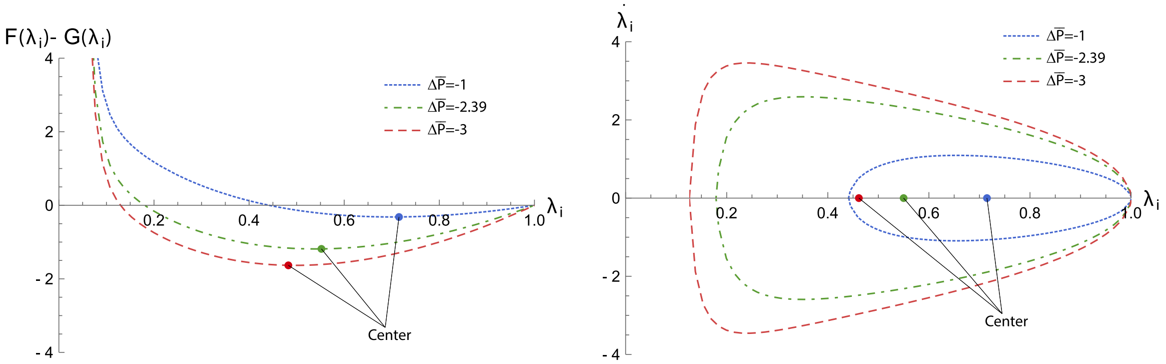
(b) Figure 6b in [1]

Fig. 3. Free oscillations. Circumferential stretch in the inner surface of the shell λ_i versus dimensionless time τ for Mooney-Rivlin (solid line) and Yeoh (dashed line) constitutive models. The reference value $\mu=1$ is taken. (a) C=1, $\lambda_{i0}=1$ and $\dot{\lambda}_{i0}=1.698$. (b) C=32, $\lambda_{i0}=1$ and $\dot{\lambda}_{i0}=9.608$.



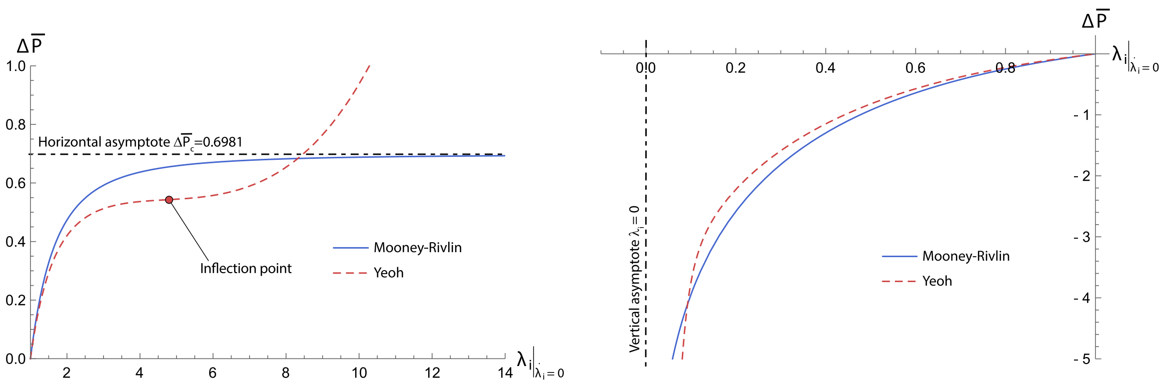
(a) Figure 8a in [1] (b) Figure 8b in [1]

Fig. 4. Forced oscillations. Yeoh constitutive model. The thickness parameter is $\mu=1$. Three values of the applied pressure are investigated: $\Delta\overline{P}=0.5$, $\Delta\overline{P}=0.525$ and $\Delta\overline{P}=1$. (a) Potential energy $F(\lambda_i)-G(\lambda_i)$ versus stretch λ_i. (b) Phase diagram, $\dot{\lambda}_i$ versus λ_i.



(a) Figure 9a in [1] (b) Figure 9b in [1]

Fig. 5. Forced oscillations. Yeoh constitutive model. The thickness parameter is $\mu=1$. Three values of the applied pressure are investigated: $\Delta\overline{P}=-1$, $\Delta\overline{P}=-2.39$ and $\Delta\overline{P}=-3$. (a) Potential energy $F(\lambda_i)-G(\lambda_i)$ versus stretch λ_i. (b) Phase diagram, $\dot{\lambda}_i$ versus λ_i.

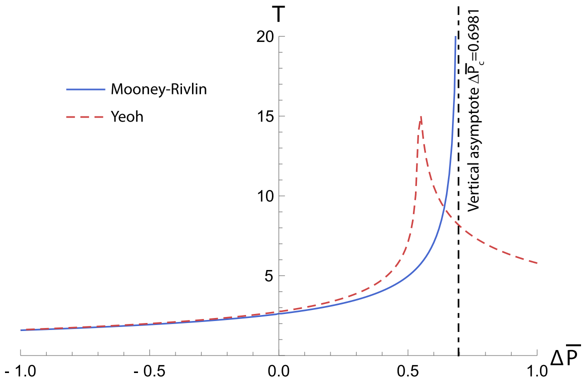


(a) Figure 10a in [1] (b) Figure 10b in [1]

Fig. 6. Forced oscillations. Applied pressure $\Delta\overline{P}$ versus the maximum stretch of the oscillation $\lambda_i|_{\dot{\lambda}_i=0}$ for Mooney-Rivlin (solid line) and Yeoh (dashed line) constitutive models. The thickness parameter is $\mu=1$. (a) Positive applied pressure and (b) negative applied pressure.

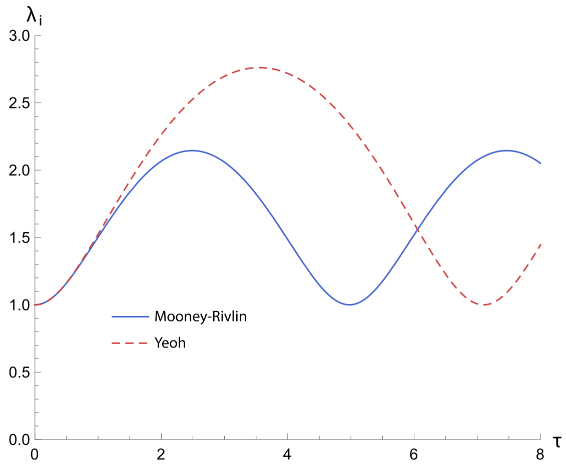
2. Forced oscillations

Figs. 4(a) and 5(a) show that the $F(\lambda_i)-G(\lambda_i)$ curve intersects twice the λ_i axis no matter the value of the applied pressure (either negative or positive). This implies that the behaviour of the shell is oscillatory for any $\Delta\overline{P}$ considered, as illustrated by the closed orbits shown in Figs. 4(b) and 5(b). As such, the data corresponding to the Yeoh material should be

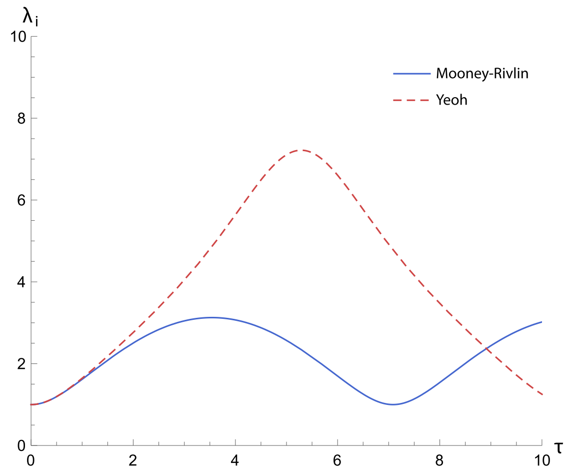


(a) Figure 11 in [1]

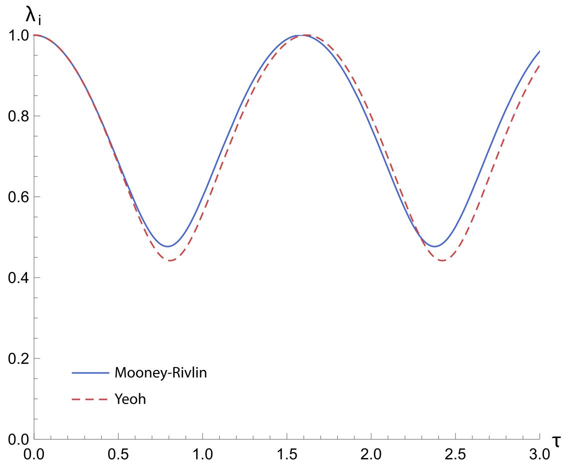
Fig. 7. Forced oscillations. Period of the oscillation T versus the applied pressure $\Delta\overline{P}$ for Mooney-Rivlin (solid line) and Yeoh (dashed line) constitutive models. The reference value $\mu=1$ is taken.



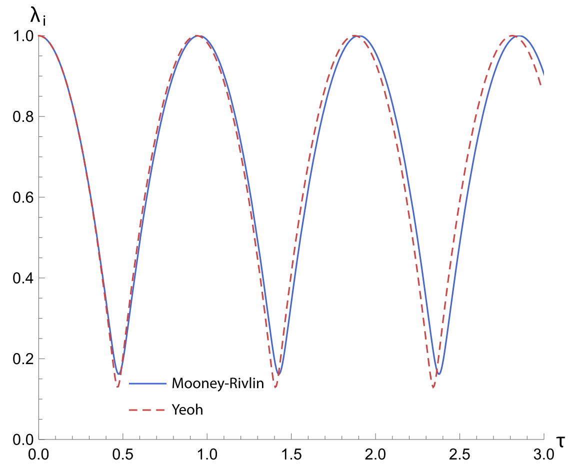
(a) Figure 13a in [1]



(b) Figure 13b in [1]



(c) Figure 13c in [1]



(d) Figure 13d in [1]

Fig. 8. Forced oscillations. Circumferential stretch in the inner surface of the shell λ_i versus dimensionless tim e τ for Mooney-Rivlin (solid line) and Yeoh (dashed line) constitu tive models. The reference value $\mu=1$ is taken. (a) $\Delta\overline{P}$ = 0.5 and $P_0=0$. (b) $\Delta\overline{P}$ = 0.6 and $P_0=0$. (c) $\Delta\overline{P}$ = − 1 and $P_0=1$. (d) $\Delta\overline{P}$ = − 3 and $P_0=3$.

removed from Fig. 12 reported in [1]. This is the other main difference with respect to the results we originally reported in our paper.

Fig. 6 shows the applied pressure $\Delta\overline{P}$ versus the maximum stretch of the oscillation $\lambda_i|_{\dot{\lambda}\ i=0}$ for positive (Fig. 6(a)) and negative (Fig. 6(b)) values of $\Delta\overline{P}$. For $\Delta\overline{P} > 0$, the applied pressure for the Yeoh material first increases with $\lambda_i|_{\dot{\lambda}\ i=0}$, reaches an inflection point for $\Delta\overline{P} = 0.54$ and then increases again.

This behaviour is significantly different from the response of the Mooney-Rivlin model which shows a $\Delta\overline{P} - \lambda_i|_{\dot{\lambda}\ i=0}$ curve which increases with $\lambda_i|_{\dot{\lambda}\ i=0}$ until it reaches an horizontal asymptote for $\Delta\overline{P} = 0.6981$. For $\Delta\overline{P} < 0$, the applied pressure decreases with $\lambda_i|_{\dot{\lambda}\ i=0}$ for both, Yeoh and Mooney-Rivlin materials.

Fig. 7 shows that the period of the oscillation T for the Yeoh material increases monotonically with the applied pressure up to $\Delta\overline{P} = 0.54$. This value of applied pressure defines the maximum period of the oscillation. Note that $\Delta\overline{P} = 0.54$ determines the inflection point in the $\Delta\overline{P} - \lambda i\,|_{\dot{\lambda}\ i=0}$ curve presented in Fig. 6(a). For applied pressures larger than 0.54 the period decreases monotonically with $\Delta\overline{P}$.

Fig. 8 shows that, according to the results presented in Figs. 4(b) and 5(b), the behaviour of the circumferential stretch in the inner surface of the shell obtained for the Yeoh material is oscillatory no matter the value of $\Delta\overline{P}$. While the response of Yeoh and Mooney-Rivlin materials for negative values of $\Delta\overline{P}$ is similar, a meaningful difference in the temporal response of λ_i is observed for $\Delta\overline{P} > 0$.

3. Conclusions

In summary, the error in Eq. (25) of [1] yielded results in which the shell modelled with the Yeoh material showed a non-oscillatory response for some specific loading conditions. This is not the case, as demonstrated in this brief note. We would like to apologize to the readers of the Journal of Sound and Vibration for any inconvenience this error may have caused.

Reference

[1] D. Aranda-Iglesias, G. Vadillo, J.A. Rodríguez-Martínez, Constitutive sensitivity of the oscillatory behaviour of hyperelastic cylindrical shells, *J. Sound Vib.* 358 (2015) 199–216.