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Journal of Sound and Vibration 280 (2005) 1151–1153

JOURNAL OF SOUND AND VIBRATION

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Discussion

Author's reply ☆

Z. Zong*

Institute of High Performance Computing, 1 Science Park Road, #0101 The Capricorn Science Park, Singapore Science Park II, Singapore 117528, Singapore

Received 5 January 2004; accepted 9 January 2004

S.A Vera, M. Febbo and P.A.A. Laura are thanked for their interest in paper [1]. They hoped that the present author would calculate stress resultants such as bending moments, since this requires obtaining second-order derivatives. This question is interesting in the sense that DQ should produce good numerical results in this case as DQ is a highly accurate numerical technique. This is the case as demonstrated in Ref. [2], where the authors compared the bending moments of a plate estimated by DQ method and analytical method.

Accordingly, I made some further calculations based on this paper [1], using the displacements to find the bending moments by two differentiations. Some of the results, time history of bending moments M_x and M_y at point $(0.1, 0.45)$, which are defined by

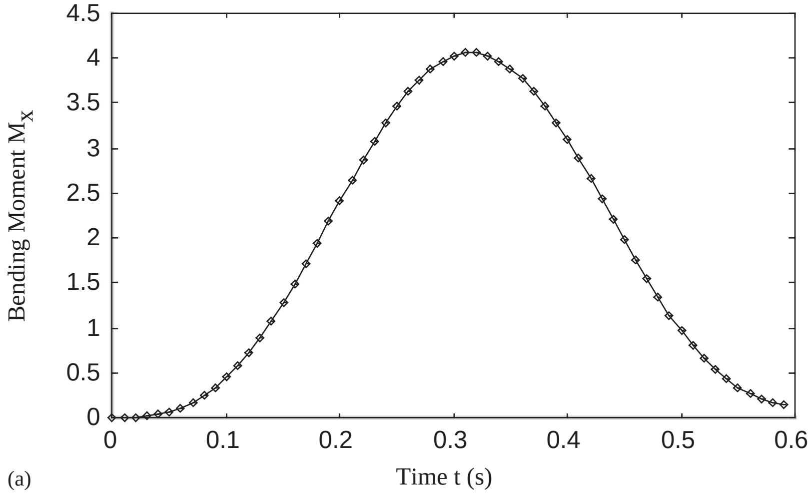
$$M_x = -D\left(\frac{\partial^2 W}{\partial x^2} + v\,\frac{\partial^2 W}{\partial y^2}\right), \quad M_y = -D\left(v\,\frac{\partial^2 W}{\partial x^2} + \frac{\partial^2 W}{\partial y^2}\right), \tag{1}$$

are shown in Fig. 1. The meanings of the symbols in the above equations can be found in Ref. [1]. In the figure, the analytical solutions are also shown, denoted by dots. From the figure, the differences between the numerical results and the analytical solution are

☆ Reply to doi: 10.1016/j.jsv.2004.01.048.

*Tel.: +65-419-1576; fax: +65-776-1962.
E-mail address: zongzhi@ihpc.a-star.edu.sg (Z. Zong).

doi:10.1016/j.jsv.2004.01.049



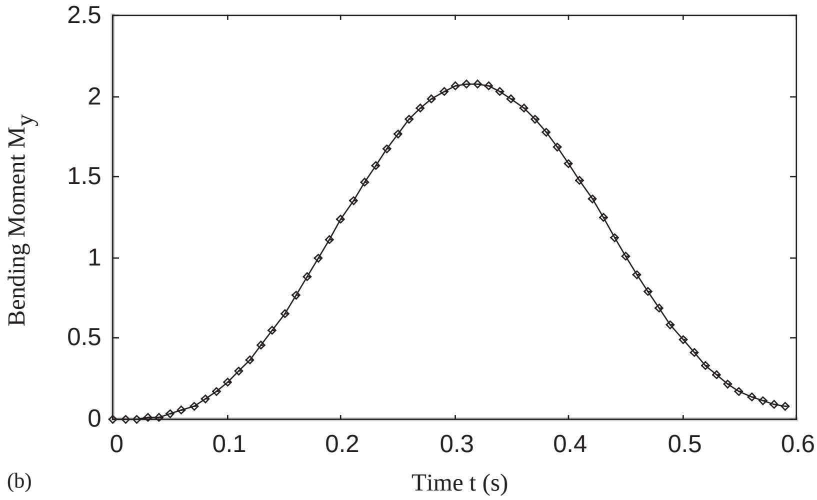


Fig. 1. Time histories of bending moments at point (0.1, 0.45): (a) M_x, (b) M_y. —, Present method; $\diamond$, analytical.

unrecognizable. The time history of the errors, defined by the difference between numerical and analytical solutions, is plotted in Fig. 2. The errors grow with time initially and then decrease with time as time exceeds 0.55 s. In general, the errors are less than 15×10^{-7}, a very good accuracy.

Again, through this example, we demonstrated the good accuracy DQ can produce, as claimed many times by various authors in various cases.

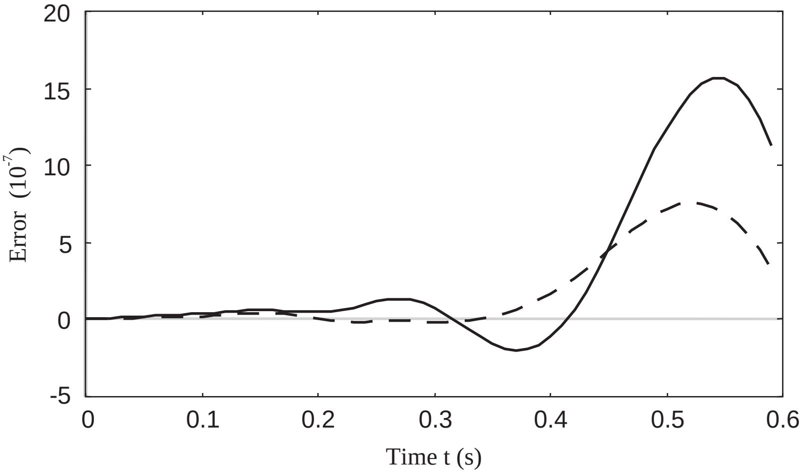


Fig. 2. Error variation with time at point (0.1, 0.45): —, M_x; - - -, M_y.

References

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