

Quick Search  

View search history | Back to results | &lt; Previous 13 of 56 Next &gt;

Download PDF Export Print E-mail Create bibliography Add to My List

**Nonlinear Dynamics**

Volume 60, Issue 3, May 2010, Pages 277-293

ISSN: 0924090X  
CODEN: NODYE  
DOI: 10.1007/s11071-009-9595-8  
Document Type: Article  
Source Type: Journal[View references \(28\)](#)[View at publisher](#) |**Nonlinear dynamics of an inclined beam subjected to a moving load**Mamandi, A.<sup>a</sup> Kargarnovin, M.H.<sup>a,b</sup> Younesian, D.<sup>c</sup> <sup>a</sup> Mechanical and Aerospace Engineering Department, Science and Research Branch, Islamic Azad University, Tehran, Iran<sup>b</sup> Mechanical Engineering Department, Sharif University of Technology, Tehran, Iran<sup>c</sup> Railway Engineering Department, Iran University of Science and Technology, Tehran, Iran**Abstract**

In this paper, the nonlinear dynamic response of an inclined pinned-pinned beam with a constant cross section, finite length subjected to a concentrated vertical force traveling with a constant velocity is investigated. The study is focused on the mode summation method and also on frequency analysis of the governing PDEs equations of motion. Furthermore, the steady-state response is studied by applying the multiple scales method. The nonlinear response of the beam is obtained by solving two coupled nonlinear PDEs governing equations of planar motion for both longitudinal and transverse oscillations of the beam. The dynamic magnification factor and normalized time histories of mid-pint of the beam are obtained for various load velocity ratios and the outcome results have been illustrated and compared to the results with those obtained from traditional linear solution. The appropriate parametric study considering the effects of the linear viscous damping, the velocity of the traveling load, beam inclination angle under zero or nonzero axial load are carried out to capture the influence of the effect of large deflections caused by stretching effects due to the beam's immovable ends. It was seen that quadratic nonlinearity renders the softening effect on the dynamic response of the beam under the act of traveling load. Also in the case where the object leaves the inclined beam, its planar motion path is derived and the targeting accuracy is investigated and compared with those from the rigid solution assumption. Moreover, the stability analysis of steady-state response for the modes equations having quadratic nonlinearity was carried out and it was observed from the frequency response curves that for the considered parameters in the case of internal-external primary resonance, both saturation phenomenon and jump phenomenon can be predicted for the longitudinal excitation. © Springer Science+Business Media B.V. 2009.

**Language of original document**

English

**Author keywords**

Frequency response analysis; Inclined beam; Mode summation method; Multiple scales method; Nonlinear vibrations; Quadratic nonlinearity

**Index Keywords**

Frequency response analysis; Inclined beams; Multiple scales methods; Non-linear vibrations; Quadratic nonlinearities

**Engineering controlled terms:** Aircraft engines; Control nonlinearities; Damping; Dynamic response; Equations of motion; Frequency response; Loads (forces); Nonlinear analysis; Problem solving; Vibration analysis; Vibration control  
**Engineering main heading:** Nonlinear equations

**References (28)** [View in table layout](#)

Export Print E-mail Create bibliography

Select:  Page

- Hilal, M.A., Zibdeh, H.S.  
**Vibration analysis of beams with general boundary conditions traversed by a moving force**  
(2000) *Journal of Sound and Vibration*, 229 (2), pp. 377-388. Cited 22 times.  
doi: 10.1006/jsvi.1999.2491  
[View at publisher](#)
- Esmailzadeh, E., Ghorashi, M.  
**Vibration analysis of beams traversed by uniform partially distributed moving masses**  
(1995) *Journal of Sound and Vibration*, 184 (1), pp. 9-17. Cited 53 times.  
doi: 10.1006/jsvi.1995.0301

**Cited by since 1996**This article has been cited 3 times in Scopus:  
(Showing the 2 most recent)

Li, G.-F., Yang, Z.-A., Xi, X.-Y.  
**The third superharmonic resonance of inclined beam subjected to harmonic excitation in temperature field**  
(2011) *Proceedings of 2011 International Conference on Electronic and Mechanical Engineering and Information Technology, EMEIT 2011*

Mamandi, A., Kargarnovin, M.H.  
**Dynamic analysis of an inclined Timoshenko beam traveled by successive moving masses/forces with inclusion of geometric nonlinearities**  
(2011) *Acta Mechanica*

[View details of all 3 citations](#)

Inform me when this document is cited in Scopus:

[Set alert](#) | [Set feed](#)**Related documents**

Showing the 2 most relevant related documents by all shared references:

Mamandi, A., Kargarnovin, M.H.  
**Dynamic analysis of an inclined Timoshenko beam traveled by successive moving masses/forces with inclusion of geometric nonlinearities**  
(2011) *Acta Mechanica*

Mamandi, A., Kargarnovin, M.H., Farsi, S.  
**An investigation on effects of traveling mass with variable velocity on nonlinear dynamic response of an inclined Timoshenko beam with different boundary conditions**  
(2010) *International Journal of Mechanical Sciences*

[View all related documents based on all shared references or select the shared references to use](#)**Find more related documents in Scopus based on:**[Authors](#) | [Keywords](#)**My Applications**

Add
















**More By These Authors**

The authors of this article have a total of **102 records** in Scopus:  
(Showing 5 most recent)

Kargarnovin, M.H., Jafari-Talookolaei, R.A., Ahmadian, M.T., Abedi, M.  
**Analytical expressions for frequency and buckling of large amplitude vibration of multilayered composite beams**  
(2011) *Advances in Acoustics and Vibration*

Hashemi, R., Kargarnovin, M.H.  
**Overall electroelastic moduli of particulate**


[Hide Applications](#)

- [View at publisher](#)
- 3  Esmailzadeh, E., Ghorashi, M.  
**Vibration analysis of a Timoshenko beam subjected to a travelling mass**  
(1997) *Journal of Sound and Vibration*, 199 (4), pp. 615-628. Cited 42 times.
- [View at publisher](#)
- 4  Foda, M.A., Abduljabbar, Z.  
**A dynamic green function formulation for the response of a beam structure to a moving mass**  
(1998) *Journal of Sound and Vibration*, 210 (3), pp. 295-306. Cited 43 times.
- [View at publisher](#)
- 5  Fryba, L.  
(1999) *Vibration of Solids and Structures Under Moving Loads*. Cited 239 times.  
Thomas Telford, London
- 6  Ichikawa, M., Miyakawa, Y., Matsuda, A.  
**Vibration analysis of the continuous beam subjected to a moving mass**  
(2000) *Journal of Sound and Vibration*, 230 (3), pp. 493-506. Cited 38 times.  
doi: 10.1006/jsvi.1999.2625
- [View at publisher](#)
- 7  Ju, S.-H., Lin, H.-T., Hsueh, C.-C., Wang, S.-L.  
**A simple finite element model for vibration analyses induced by moving vehicles**  
(2006) *International Journal for Numerical Methods in Engineering*, 68 (12), pp. 1232-1256. Cited 11 times.  
doi: 10.1002/nme.1748
- [View at publisher](#)
- 8  Kargarnovin, M.H., Younesian, D.  
**Dynamics of Timoshenko beams on Pasternak foundation under moving load**  
(2004) *Mechanics Research Communications*, 31 (6), pp. 713-723. Cited 41 times.  
doi: 10.1016/j.mechrescom.2004.05.002
- [View at publisher](#)
- 9  Kargarnovin, M.H., Younesian, D., Thompson, D.J., Jones, C.J.C.  
**Response of beams on nonlinear viscoelastic foundations to harmonic moving loads**  
(2005) *Computers and Structures*, 83 (23-24), pp. 1865-1877. Cited 33 times.  
doi: 10.1016/j.compstruc.2005.03.003
- [View at publisher](#)
- 10  Kidarsa, A., Scott, M.H., Higgins, C.C.  
**Analysis of moving loads using force-based finite elements**  
(2008) *Finite Elements in Analysis and Design*, 44 (4), pp. 214-224. Cited 6 times.  
doi: 10.1016/j.finel.2007.11.013
- [View at publisher](#)
- 11  Lee, H.P.  
**The dynamic response of a Timoshenko beam subjected to a moving mass**  
(1996) *Journal of Sound and Vibration*, 198 (2), pp. 249-256. Cited 27 times.  
doi: 10.1006/jsvi.1996.0567
- [View at publisher](#)
- 12  Lin, Y.-H., Trethewey, M.W.  
**Finite element analysis of elastic beams subjected to moving dynamic loads**  
(1990) *Journal of Sound and Vibration*, 136 (2), pp. 323-342. Cited 95 times.
- [View at publisher](#)
- 13  Lou, P., Dai, G.-L., Zeng, Q.-Y.  
**Finite-element analysis for a Timoshenko beam subjected to a moving mass**  
(2006) *Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science*, 220 (5), pp. 669-678. Cited 7 times.  
doi: 10.1243/09544062JMES119
- [View at publisher](#)
- 14  Michaltsos, G.T.  
**Dynamic behaviour of a single-span beam subjected to loads moving with variable speeds**  
(2002) *Journal of Sound and Vibration*, 258 (2), pp. 359-372. Cited 37 times.  
doi: 10.1006/jsvi.2002.5141
- [View at publisher](#)
- 15  Michaltsos, G., Sophianopoulos, D., Kounadis, A.N.  
**The effect of a moving mass and other parameters on the dynamic response of a simply supported beam**  
(1996) *Journal of Sound and Vibration*, 191 (3), pp. 357-362. Cited 60 times.  
doi: 10.1006/jsvi.1996.0127
- [View at publisher](#)
- 16  Nayfeh, A.H., Mook, D.T.  
(1979) *Nonlinear Oscillations*. Cited 2812 times.  
Wiley-Interscience, New York
- 17  Olsson, M.  
**On the fundamental moving load problem**  
(1991) *Journal of Sound and Vibration*, 145 (2), pp. 299-307. Cited 59 times.


[View at publisher](#)

- 18  Savin, E.  
**Dynamic amplification factor and response spectrum for the evaluation of vibrations of beams under successive moving loads**  
 (2001) *Journal of Sound and Vibration*, 248 (2), pp. 267-288. Cited 12 times.  
 doi: 10.1006/jsvi.2001.3787


[View at publisher](#)

- 19  Siddiqui, S.A.Q., Golnaraghi, M.F., Heppler, G.R.  
**Dynamics of a flexible beam carrying a moving mass using perturbation, numerical and time-frequency analysis techniques**  
 (2000) *Journal of Sound and Vibration*, 229 (5), pp. 1023-1055. Cited 10 times.  
 doi: 10.1006/jsvi.1999.2449

[View at publisher](#)

- 20  Şimşek, M., Kocatürk, T.  
**Nonlinear dynamic analysis of an eccentrically prestressed damped beam under a concentrated moving harmonic load**  
 (2009) *Journal of Sound and Vibration*, 320 (1-2), pp. 235-253. Cited 8 times.  
 doi: 10.1016/j.jsv.2008.07.012


[View at publisher](#)

- 21  Thambiratnam, D., Zhuge, Y.  
**Dynamic analysis of beams on an elastic foundation subjected to moving loads**  
 (1996) *Journal of Sound and Vibration*, 198 (2), pp. 149-169. Cited 43 times.  
 doi: 10.1006/jsvi.1996.0562

[View at publisher](#)

- 22  Wang, R.-T.  
**Vibration of multi-span Timoshenko beams to a moving force**  
 (1997) *Journal of Sound and Vibration*, 207 (5), pp. 731-742. Cited 41 times.


[View at publisher](#)

- 23  Wang, R.-T., Chou, T.-H.  
**Non-linear vibration of Timoshenko beam due to a moving force and the weight of beam**  
 (1998) *Journal of Sound and Vibration*, 218 (1), pp. 117-131. Cited 14 times.

[View at publisher](#)

- 24  Wang, R.-T., Lin, J.-S.  
**Vibration of multi-span Timoshenko frames due to moving loads**  
 (1998) *Journal of Sound and Vibration*, 212 (3), pp. 417-434. Cited 12 times.


[View at publisher](#)

- 25  Wu, J.-J.  
**Dynamic analysis of an inclined beam due to moving loads**  
 (2005) *Journal of Sound and Vibration*, 288 (1-2), pp. 107-131. Cited 18 times.  
 doi: 10.1016/j.jsv.2004.12.020

[View at publisher](#)


- 26  Xu, X., Xu, W., Genin, J.  
**A non-linear moving mass problem**  
 (1997) *Journal of Sound and Vibration*, 204 (3), pp. 495-504. Cited 16 times.

[View at publisher](#)

- 27  Wayou, A.N.Y., Tchoukuegno, R., Wofo, P.  
**Non-linear dynamics of an elastic beam under moving loads**  
 (2004) *Journal of Sound and Vibration*, 273 (4-5), pp. 1101-1108. Cited 11 times.

- 28  Younesian, D., Kargarnovin, M.H., Thompson, D.J., Jones, C.J.C.  
**Parametrically excited vibration of a timoshenko beam on random viscoelastic foundation jected to a harmonic moving load**  
 (2006) *Nonlinear Dynamics*, 45 (1-2), pp. 75-93. Cited 9 times.  
 doi: 10.1007/s11071-006-1460-4

[View at publisher](#)

 Kargarnovin, M. H.; Mechanical and Aerospace Engineering Department, Science and Research Branch, Islamic Azad University, Tehran, Iran; email: [mhkargar@sharif.edu](mailto:mhkargar@sharif.edu)  
 © Copyright 2010 Elsevier B.V., All rights reserved.

**Nonlinear Dynamics**

Volume 60, Issue 3, May 2010, Pages 277-293

[View search history](#) | [Back to results](#) | [< Previous 13 of 56](#) [Next >](#)[Top of page](#)[Search](#) [Sources](#) [Analytics](#) [My alerts](#) [My list](#) [My settings](#)[Live Chat](#) [Help](#)

[About Scopus](#)  
[What is Scopus](#)  
[Content coverage](#)  
[What do users think](#)  
[Latest](#)  
[Tutorials](#)  
[Developers](#)

[Contact and Support](#)  
[Contact and support](#)  
[Live Chat](#)

[About Elsevier](#)  
[About Elsevier](#)  
[About SciVal](#)  
[About SciVal](#)  
[Terms and Conditions](#)  
[Privacy Policy](#)



Copyright © 2011 Elsevier B.V. All rights reserved. SciVerse® is a registered trademark of Elsevier Properties S.A., used under license. Scopus® is a registered trademark of Elsevier B.V.