6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11 – 15 June 2018, Glasgow, UK

INTEGRATION SCHEMES FOR THE TRANSIENT DYNAMICS OF NONLINEAR CABLE STRUCTURES

Z. Lozina[1], D. Sedlar[2] and A. Bartulovic[3]

[1] University of Split, FESB, zeljan.lozina@fesb.hr, *marjan.fesb.hr/~lozina*
[2] University of Split, FESB, damir.sedlar@fesb.hr
[3] University of Split, FESB, andjela.bartulovic@fesb.hr

Key Words: *Time integration schemes, Nonlinear dynamic problems, Space cable structures.*

The recently developed time integration schemes [3] is analysed and implemented to the transient analysis of the space cable structures. The results are compared to the corresponding implementation of [1] and [4].

The space cable structures exhibit a number of common properties regarding nonlinearities and frequency spectrum involving low frequency transversal and higher frequency longitudinal modes. The nonlinear cable structures undergoing large displacements and rotations are discretized with finite cable elements and B-splines. The time integration is performed for both models and issues related to the space discretisation are additionally addressed.

The special attention is addressed to the numerical efficiency of the time integration schemes. The spectral radius based analysis for corresponding time integration schemes performed in [1-4] is reliable in linear domain and it can only give guidance for nonlinear problems. The important issues: user controlled higher frequency damping, overshooting, amplitude decay and period elongations are typically monitored in simple benchmark examples.

The focus of the paper is a development and an implementation of the variable time step algorithm with error monitoring mechanism and step size control. The objective of the paper is to put together desirable properties scattered over a many schemes in order to design reliable algorithm.

REFERENCES

[1] K.J. Bathe and M.M.I. Baig, On a composite implicit integration procedure for nonlinear dynamics, *Computers and Structures*, Vol. **83**, pp. 2513–2524, 2005.

[2] K.J. Bathe and G. Noh, *Insight into an implicit time integration scheme for structural dynamics*, *Computers and Structures*, Vol. **98-99**, pp. 1–6, 2012.

[3] C. Kadapa, W.G. Dettmer and D. Perić, On the advantages of using the first-order generalised-alpha scheme for structural dynamic problems, Vol. **193**, pp. 226-238, 2017.

[4] J. Chung and G.M. Hulbert, A time integration algorithm for structural dynamics with improved numerical dissipation: The generalized-a method, Journal of Applied Mechanics. Vol **60**, pp. 371-375, 1993.