Abstract

The Present manuscript reports the solution of well known non linear wave mechanics problem called KDV equation, here main emphasis is given on the Mathematical modeling of traveling waves and their solutions in the form of Korteweg-de Vries equation (KdV) It is a non-linear Partial Differential Equation (PDE) of third order which arises in a number of physical applications such as water waves, elastic rods, plasma physics etc. We present numerical solution of the above equation using B-spline FEM (Finite Element Method) approach. The ultimate goal of the paper is to solve the above problem using numerical simulation in which the accuracy of computed solutions is examined by making comparison with analytical solutions, which are found to be in good agreement with each other along with that we discussed the physical interpolation of the soliton study in which we found that the travel waves reaches to the maximum magnitude of the velocity in the short time of the interval and there is an uncertainty in the motion of the moving waves. Another important observation we found that the maximum magnitude of the velocity in the most of the time domain is around 1 but in some of the condition waves having a unnatural phenomena which is called the existence of the doubly soliton is seemed frequently. All above observation which is clearly indication of the generic outcome of a
weakly nonlinear long-wave asymptotic analysis of many physical systems. The another
achievement of the work is to implementation of the cubic B-spline FEM in the above non linear
propagating waves phenomena.

References

- Korteweg D. J., de Vries G., On the change of form of long waves advancing in a
  rectangular canal, and on a new type of long stationary waves. Phil. Mag. J. Science, 39 (1895)
  422-443.
- Boussinesq, J. (1877), Essai sur la theorie des eaux courantes, Memoires presentes par
- N.J. Zabusky and M.D. Kruskal, Interaction of solitons in a collisionless plasma and the
- Miura, Robert M.; Gardner, Clifford S.; Kruskal, Martin D. (1968), "Korteweg-de Vries
  equation and generalizations. II. Existence of conservation laws and constants of motion", J.
  Mathematical Phys. 9: 1204–1209
  Pure Applied Math. 21: 467–490,
- Dingemans, M.W. (1997), Water wave propagation over uneven bottoms, Advanced
  Series on Ocean Engineering, 13, World Scientific, Singapore., 2 Parts, 967 pages
  7th-order KdV Equation by Pseudospectral Method and Darvishi’s Preconditioning, 2, pp.
  1097–1106
- Malik Zawwar Hussain., Muhammad Sarfraz., Ayesha Shakeel , Shape Preserving
  Surfaces for the Visualization of Positive and Convex Data using Rational Bi-quadratic Splines.,
  International Journal of Computer Applications., 27(10), 2011
  and the Recurrence of Initial States”, Phys. Rev. Lett. 15: 240–243,
- K. Abe and 0. Inoue, Fourier expansion solution of the Korteweg-de Vries equation, J.
- T.R. Taha and M.J. Ablowitz, Analytical and numerical aspects of certain nonlinear
Numerical Investigation of Separated Solitary Waves Solution for KDV Equation through Finite Element Technique


Index Terms
Computer Science
Applied Mathematics

Keywords
B-Spline   FEM   KDV   Separated solitary Waves