An implementation of the Method of Fundamental Solutions for the Dynamics of a Plate Large

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The nonlinear, dynamics of a plate large deflection is a subject of investigations across many disciplines. Various models have been proposed; among the most frequently encountered are those related to that of von Karman. In this case the initial-boundary value problem of the dynamics of a plate large deflection is described by two nonlinear, coupled partially differential equations of fourth order with two initial conditions and two boundary conditions at each boundary point.

There are various means of simulating the dynamic response of thin nonlinear plate, to various degrees of accuracy. The proposal of this paper is to implement one of the meshfree method i.e. the Method of Fundamental Solutions. The problem is solved in discretised time domain. This discretisation is done in a conception of the Finite differences Method. The nonlinearity of the equations, obtained at each time step, is solved by application of Picard iterations. For each iterations step a boundary value problem is to solve. Moreover, the equations at each iteration step are inhomogeneous ones. So, the approximation by Radial Basis Function is applied and a particular solution of boundary value problems is obtained. The final solution is calculated by implementation of the Method of Fundamental Solution.

The numerical experiment has confirmed that the proposed numerical procedure gives the solutions with demanded accuracy and is good tool to solve the considered problem.

Keywords: the Method of Fundamental Solutions, approximation by Radial Basis Function, Picard iterations, dynamics of a plate large deflection, von Karman plate equations.