The Method of Lines in Computing Viscoelastic Relaxation of the Earth
Ladislav Hanyk 1, Citrat Matyska 1, and David A. Yuen 2

1 Department of Geophysics, Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic
2 University of Minnesota Supercomputing Institute and Department of Geology and Geophysics, Minneapolis

e-mail: ladislav.hanyk@mff.cuni.cz, WWW: http://geo.mff.cuni.cz/

MATHMATICAL FORMULATION

SYSTEM OF PDEs in Time and Radius
(after spherical harmonic decomposition)

\[ \frac{\partial x}{\partial t} \bigg|_{s_0} = \left. \frac{\partial x}{\partial r} \right|_{s_0} \]

\[ \Delta x = \frac{\partial^2 x}{\partial r^2} + \frac{1}{r} \frac{\partial x}{\partial r} \]

\[ \text{INITIAL BOUNDARY VALUE PROBLEM} \]

\[ \text{SEMIDISCRETIZATION} \]

\[ \Delta x = \frac{\partial^2 x}{\partial r^2} + \frac{1}{r} \frac{\partial x}{\partial r} \]

\[ \text{INITIAL VALUE APPROACH by the Method of Lines (IV/MOL)} \]

\[ \text{SEMIDISCRETIZATION} \]

\[ \text{INITIAL VALUE PROBLEM} \]

\[ P(x_1, x_2, \ldots, x_N) = 0 \]

\[ \text{a system of ordinary differential equations} \]

\[ \text{where} \]

\[ W(x_1, x_2, \ldots, x_N) = \frac{\partial x}{\partial t} \bigg|_{s_0} = \left. \frac{\partial x}{\partial r} \right|_{s_0} \]

\[ P(x_1, x_2, \ldots, x_N) = 0 \text{ are constant } n \text{-dimensional matrices,} \]

\[ x_1, x_2, \ldots, x_N \text{ are time and radius dependent} \]

\[ N \text{ is a number of grid points} \]

\[ \text{ couple} \text{ of spherical harmonic coefficients} \]

\[ \text{RADIUS VALUE PROBLEM} \]

\[ \frac{\partial x}{\partial r} = \Delta x \]

\[ \text{where} \]

\[ x_1, x_2, \ldots, x_N \text{ are radial dependent} \]

\[ \text{in the spherical harmonic degree} \]

\[ N \text{ is a number of grid points} \]

\[ \text{ANALYTICAL SOLUTION} \]

\[ \text{DELIBERATION in Radii} \]

\[ \text{Highlights of the Method of Lines} \]

\[ \text{CONCLUSIONS} \]

\[ \text{IMPLEMENTATION of the IV/MOL APPROACH} \]

\[ \text{MODELS AND RESULTS} \]

\[ \text{REFERENCES} \]