Modern Taylor Series Method in Numerical Integration: Part 2

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Abstract: The paper deals with extremely exact, stable, and fast numerical solutions of systems of differential equations with initial condition – initial value problems. Systems of ordinary differential equations are solved using variable order, variable step-size Modern Taylor Series Method. The Modern Taylor Series Method is based on a recurrent calculation of the Taylor series terms for each time interval. Thus, the complicated calculation of higher order derivatives (much criticized in the literature) need not be performed but rather the value of each Taylor series term is numerically calculated.
The paper present the solution of linear and nonlinear problems. As a linear problem, the telegraph equation was chosen. As a nonlinear problem, the behavior of Lorenz system was analyzed. All experiments were performed using MATLAB software, the newly developed nonlinear solver that uses Modern Taylor Series Method was used. Both linear and nonlinear solvers were compared with state of the art solvers in MATLAB.

Keywords: Taylor series method, ordinary differential equations, technical initial value problems.