A collocation formulation for variable stepsize multistep methods

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Multistep methods are classically constructed by specially designed difference operators on an equidistant time grid. To make them practically useful, they have to be implemented by varying the stepsize according to some error-control algorithm. It is well known how to extend Adams and BDF formulas to a variable stepsize formulation. Here we present a collocation approach to construct variable stepsize formulas. We make use of piecewise polynomials to show that every k-step method of order $k+1$ has a variable stepsize polynomial collocation formulation.