Polynomial Simulation of Functional Differential Equations with Delayed Argument

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Abstract. A simple computational approach will be developed for a family of differential equations in one independent variable with a single delayed argument in the vector field. These equations can be mapped into a system of ODEs of a finite size, a subsystem of which involves only the function controlling the deviating argument. Key features in addition to the simplicity include freedom from root finding techniques and developing a continuous approximation. The method will be established for state independent delays with real analytic initial data, and then extended to stiff equations and nonanalytic data. The philosophy will then be extended to handle state dependent delays and distributed delays. The differential equations can be nonlinear and may be retarded, neutral or advanced. Conditions for convergence of the approximation are established, and results of some numerical experiments are reported to indicate the robustness of the approach.