Rational finite differences method based on the barycentric interpolants for ODEs

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Stiff systems of ODEs arise widely in the mathematical modeling of physical and biological phenomena. In this study, we first employ the linear barycentric rational finite differences method for the numerical solution of stiff systems of ODEs which is derived by exactly differentiating the linear barycentric rational interpolant. The linear stability behavior of the proposed method with respect to the standard test problem of Dahlquist is also investigated. In addition, for obtaining the methods with more desirable stability properties in this class, the adaptive version of such methods is introduced. The efficiency and capability of the introduced methods are verified by solving some well-known stiff problems.