Title: Recent advances on the numerical solution of ODEs and DAEs by implicit Runge-Kutta type methods

Abstract: We consider the application of implicit Runge-Kutta (IRK) type methods
to various systems of differential equations. First we consider systems
of implicit ordinary differential equations (ODEs) with stiffness.
We present some results about sufficient conditions ensuring
local contractivity, hence convergence, of modified Newton iterations of
IRK methods with step size conditions independent of stiffness.
Second we consider systems of differential-algebraic equations (DAEs)
of index two. We present some techniques to obtain superconvergence
of non-stiffly accurate IRK methods, such as Gauss and RadauIA methods.
We also discuss the development of predictors for the internal stages of IRK methods.