The Hong Kong Polytechnic University
Department of Applied Mathematics

Lecture series on Runge-Kutta methods for differential equations

By

Prof. Georgios Akrivis
University of Ioannina

Bibliography

Professor Georgios Akrivis is a Full Professor at Department of Computer Science and Engineering, University of Ioannina, Greece. Professor Akrivis received PhD degree from University of Munich, Germany. He was an Assistant and Associate Professor at University of Crete, and he moved to University of Ioannina as Full Professor in 1995. Professor Akrivis' research interests include the numerical solution and analysis of linear and nonlinear evolutionary partial differential equations. He has published over 50 papers in journals like SIAM J. Numerical Analysis, Numerische Mathematik, and Mathematics of Computation. He is currently an Associate Editor of SIAM Journal on Numerical Analysis.

Click to join (Zoom)

Date: 20 – 22 July 2022 (Wednesday to Friday)
Time: 15:00-16:00 (Hong Kong Standard Time GMT +8)
Venue: Online Talk via Zoom (Meeting ID: 975 9243 7338/passcode: 072022)
Speaker: Prof. Georgios Akrivis, University of Ioannina
Host: Dr. Buyang Li, The Hong Kong Polytechnic University
Click to join:
https://polyu.zoom.us/j/97592437338?pwd=RnE5aDlHTmI0cXFxeDY4dWFDdHN2Zz09

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Runge–Kutta methods: Part I

Georgios Akrivis

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and
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Abstract

In this talk, we shall present a short overview of Runge–Kutta methods and highlight some of their properties. We start by recalling the general form of Runge–Kutta methods, comment on the usual assumptions on their coefficients, and present concrete examples, such as some well-known low order methods and three families of particularly important Runge–Kutta methods, namely the Gauss, Radau IIA and Lobatto methods. We define the order of a Runge–Kutta method and briefly comment on its determination.

Then, we introduce the collocation methods and discuss their relation to Runge–Kutta methods.

Finally, we present the discontinuous Galerkin time-stepping methods for linear differen-tial equations and interpret them as modified Radau IIA methods.

Runge–Kutta methods: Part II

Georgios Akrivis

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Abstract

We recall the two famous Dahlquist test equations and discuss the fundamental concepts of A- and B-stability of Runge–Kutta methods as well as the algebraic stability and its relation to the B-stability.

Runge–Kutta methods: Part III

Georgios Akrivis

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Abstract
We consider the discretization of linear autonomous parabolic equations by Runge–Kutta methods and discuss the order reduction phenomenon, first discovered by Michel Crou-zeix in 1975.