Spherical Essentially Non-Oscillatory (SENO) Interpolations and SLERP-TVDRK (STVDRK) Integrators

Shing-Yu Leung

Department of Mathematics, The Hong Kong University of Science and Technology, Hong Kong SAR

Email: masyleung@ust.hk

This presentation introduces numerical methods for spherical data and differential equations on spheres. First, we present two interpolation techniques on S^2: (1) Spherical Interpolation of order n (SIDER-n), a generalization of Bézier curves for spheres, and (2) Spherical Essentially Non-Oscillatory (SENO) interpolation, which reduces spurious oscillations in high-order reconstructions for curves with kinks or sharp derivative discontinuities. In the second part, we propose SLERP-TVDRK (STVDRK), a class of Total Variation Diminishing Runge-Kutta (TVDRK) integrators for solving spherical differential equations. These methods use the sphere's exponential map and spherical linear interpolation (SLERP), and improve accuracy without requiring projection, enabling straightforward implementation.