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Li-Lian Wang* (lilian@ntu.edu.sg), Division of Mathematical Sciences, School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore, 637371, Singapore. *Efficient High-Order Methods Using Bandlimited Basis Functions.*

Algebraic polynomials have been a major tool for numerical approximations, in this talk, we shall introduce an alternative apparatus for high-order approximations, which enjoys some notable advantages over the polynomial counterparts. Basically, we shall propose spectral/spectral element methods using bandlimited basis function, i.e., the prolate spheroidal wave functions. The use of such bases leads to quasi-uniform grids and enhances the resolution. As some applications, we shall develop efficient prolate spectral element methods for PDEs on the sphere, where the gridding on the sphere is based on the cubed-sphere transform. We shall present various numerical examples of PDEs for texture synthesis, phase-transition and geophysical applications. We shall also report some fundamental approximation results. (Received September 22, 2009)