Sub-spherical harmonics - Laplacian eigenfunctions of the sub-domains on the sphere

Janakiraman Subburathnam*†[1] and Venkateswaran Krishnan[2]

[1]Centre for Development of Advanced Computing, Bangalore – India
[2]Center for Applicable Mathematics [Bangalore] – India

Abstract

The emergence of exascale computing hardware as a heteorogeneous, loosely coupled , distributed memory parallel architecture necessitates a reformulation of traditional spectral transform algorithms. In the process of construction of reformulated spectral transform algorithms, one encounters the need for existence of local Hilbert basis functions on the sub-domains of the sphere. This work addresses mathematical and theoretical underpinnings of this open question.

Subspherical harmonics are Laplacian eigenfunctions of the sub-domains on the sphere. They are the natural extension of spherical harmonics to the sub-domains of the sphere and hence inherit many of the characteristics of them. Unlike the spherical harmonics whose degree and order are of integer type, Sub-spherical harmonics are of general type of order and degree (non-integer).They also introduce boundary conditions in their development, with some computational consequences.

Keywords: Laplacian Eigenfunctions, Local Harmonic functions, Multi, domain spectral method

*Speaker
†Corresponding author: jraman@cdac.in