

## Yin-Yang-Zhong: An overset grid for a sphere

KAGEYAMA, Akira<sup>1\*</sup>

<sup>1</sup>Graduate School of System Informatics, Kobe University

Computation in a spherical region bounded by a constant radius is important in various fields of science and technology. Spatial discretization inside a sphere is not simple because there is no orthogonal coordinate system that fits to a sphere, without a coordinate singularity. The spherical polar coordinate system, for example, has two kinds of coordinate singularity; one on the poles and another on the origin. Singularity should be avoided in numerical simulations because it causes grid convergence around the singular point. We have developed a new grid system for a sphere, Yin-Yang-Zhong grid, which is an overset grid system composed of Yin-Yang grid and Zhong grid. Yin-Yang grid itself is an overset grid system that covers the outer spherical shell part inside the sphere. Zhong grid is a Cartesian grid-base system to cover the central part of the sphere. We have developed a magnetohydrodynamic simulation code for a sphere based on the Yin-Yang-Zhong grid. The code is parallelized with MPI. We have performed a quantitative tests of the code with diffusion and advection problems.

Keywords: Yin-Yang grid, overset grid, computer simulation, Yin-Yang-Zhong grid