universität innsbruck

Evaluation of Multigrid Efficiency

Context: Numerical Simulations; Cosmic-Ray Transport; Multigrid

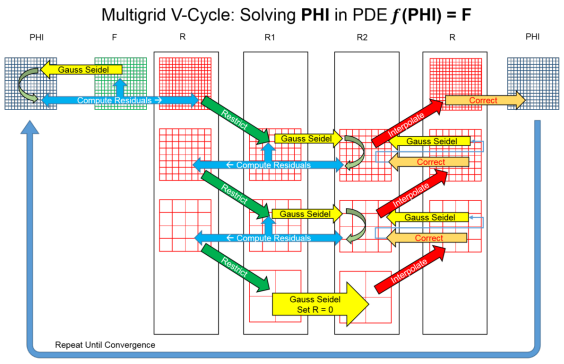
Supervisor: Ralf Kissmann

Abstract

Cosmic-ray transport can be described via a linear, four-dimensional transport equation, with diffusion and advection both in configuration space and in momentum. Such linear partial differential equations can be handled numerically by first discretising the equation using finite differences and then solving the corresponding linear system of equations. In the computational astroparticle physics group, we often employ a multigrid method to solve this system of equations. However, there is a broad range of different aspects of a multigrid scheme that can be adapted to optimise the solution speed. The focus of this bachelor topic is to analyse the different possible choices in setting up a multigrid scheme via a local Fourier analysis. The resulting estimates will then be compared with the performance of an already implemented multigrid scheme.

Helpful Skills

- Interest in mathematical analysis
- Interest in numerical modelling



Schematics of a multigrid scheme (Adilnisar on Wikipedia)