Abstract

Hyperbolic equations are used extensively in applications including fluid dynamics, astrophysics, electro-magnetism, semi-conductor devices, and biological sciences. High order accurate numerical methods are efficient for solving such partial differential equations, however they are difficult to design because solutions may contain discontinuities. In this talk we will survey several types of high order numerical methods for such problems, including weighted essentially non-oscillatory (WENO) finite difference and finite volume methods, discontinuous Galerkin finite element methods, and spectral methods. We will discuss essential ingredients, properties and relative advantages of each method, and provide comparisons among these methods. Recent development and applications of these methods will also be discussed.

This talk should be accessible to graduate students.