1059-35-228 **Xi Ronald Chen*** (xqroy@math.unm.edu). *New development in Hermite Method.* Preliminary report.

We study arbitrary-order Hermite difference methods for the numerical solution of initial-boundary value problems for symmetric hyperbolic systems. We have developed a ghost-cell approach for Hermite method concerning the boundary condition whereby the unknown data is chosen to enforce the boundary conditions for a complete space-time polynomial on the boundary. An alternative explicit approach will also be discussed, in which high derivatives have been truncated to preserve the stability and independence of the time-stepping. We also study order-adaptive implementations of Hermite methods for hyperbolic and singularly perturbed parabolic initial value problems. Exploiting the facts that Hermite methods allow the degree of the local polynomial representation to vary arbitrarily from cell to cell. This allows for extremely accurate simulation of viscous shock waves at low computational cost. We also discuss the Hermite-Taylor methods in a composite overlapping grid framework in order to enable simulations in complex geometries. We present in details how Hermite method works in many different cases. Numerical experiments are included to demonstrate the resolution of the methods for large m as well as illustrate the basic theoretical results. (Received February 23, 2010)