

1086-65-2413

**Katharine F Gurski\*** (kgurski@howard.edu), Department of Mathematics, Howard University, Washington, DC 20059. *A Simple Construction of Nonstandard Finite Difference Schemes Applied to SIR Problems.*

We have developed a simple and solid mathematical construction for nonstandard finite difference (NSFD) schemes using standard differential equation approximation techniques such as introducing artificial viscosity. While NSFD schemes have been employed to calculate numerical solutions to difficult nonlinear differential equations to machine precision, these schemes are not used by the bulk of mathematicians and scientists. Currently the technique needed to define a NSFD scheme for a particular differential equation requires extensive physical insight into the behavior of the modeled entity and has not been extended to general systems of nonlinear differential equations. We extend the analysis of Erdogan and Ozis by presenting a construction for second order nonlinear autonomous functions that constructs the numerator and denominator functions for Mickens' equivalent schemes. We extend this result to systems of up to three differential equations and demonstrate the advantages on applications using SIR models. (Received September 25, 2012)