Abstract

Numerical simulations are becoming a more effective tool for conducting detailed investigations into the evolution of our universe. In this article, we show how the framework of numerical relativity can be used for studying cosmological models. The author is working to develop a large-scale simulation of the dynamical processes in the early universe. These take into account interactions of dark matter, scalar perturbations, gravitational waves, magnetic fields and a dynamic plasma. The code described in this report is a GRMHD code based on the Cactus framework and is structured to utilize one of several different differencing methods chosen at run-time. It is being developed and tested on the Texas Learning and Computation Center's Xanadu Cluster.