"Reverse engineering" in designing scalar field potentials for cosmology[*]

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ABSTRACT

The talk is an introduction to numerical investigations on cosmological models with scalar field and matter using the Cactus code – a computational tool for numerically solving the Einstein equations. We developed two thorns for this purpose, the Cosmo thorn (to deal with initial cosmological data, parameters and functions for Cactus code) and RealSF thorn (which is solving the Klein-Gordon equation). We tested the convergence and accuracy of the numerical time evolution for cosmological models with different type of potentials of the scalar field. Then, using as initial data for the Cactus code the newly deduced solutions for the Friedmann equations with one scalar field and matter added, we studied numerically some of the above potentials and the influence of the pressureless dust matter and radiative matter on the time behavior of the universe, as given by our codes.