Stability analysis of the cosmological models in various fluids

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Abstract

From the recent observational data, it is assumed that our universe is spatially flat and has suffered two acceleration phases. Since the discovery of accelerated expansion in 1998, there have been several studies for search of candidates capable of this. In present work we try to understand the late time accelerated expansion of the universe and analyze its stability which is assumed to be composed of various kinds of fluids using dynamical system analysis. We begin our understanding of the universe by considering it completely dark matter filled, subsequently, we assume universe completely filled with perfect fluid (with equation of state $p = \omega\rho$). Then we consider certain non-interacting mixtures of various fluids in which we begin with mixture of dark matter and perfect fluid. Subsequently, we introduce dark energy and consider the universe filled with a mixture of dark matter, perfect fluid and dark energy wherein we consider varying ω_{DE} and try to understand the stability of the universe. Later, we consider a mixture of dark matter, perfect fluid and canonical scalar field with potential as a candidate for dark energy, where we consider two kinds of potential: exponential and power law. Finally, certain non-canonical scalar fields are considered as dark energy candidate and various such mixtures have been studied. In each of these cases, we try to analyze the domination era, stability conditions, ω_{eff} as well as the acceleration phase.