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A new generic and structurally stable cosmological model without singularity

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Dynamical systems methods are used to investigate a cosmological model with non-minimally coupled scalar field and asymptotically quadratic potential function. We found that for values of the non-minimal coupling constant parameter $\frac{3}{16} < \xi < \frac{1}{4}$ there exists an unstable asymptotic de Sitter state giving rise to non-singular beginning of universe. The energy density associated with this state depends on value of the non-minimal coupling constant and can be much smaller than the Planck energy density. For $\xi = \frac{1}{4}$ we found that the initial state is in form of the static Einstein universe. Proposed evolutional model, contrary to the seminal Starobinsky's model, do not depend on the specific choice of initial conditions in phase space, moreover, a small change in the model parameters do not change the evolution thus the model is generic and structurally stable. The values of the non-minimal coupling constant can indicate for a new fundamental symmetry in the gravitational theory. We show that Jordan frame and Einstein frame formulation of the theory are physically nonequivalent.

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