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Noether Symmetry Analysis in Scalar Tensor Cosmology : A Study of Classical and Quantum Cosmology

The present work deals with a complex scalar field in scalar tensor gravity theory in the background of spatially flat Friedmann-Lemaitre-Robertson-Walker (FLRW) geometry. Noether symmetry analysis has been used to determine the classical cosmological solution of a scalar field in scalar-tensor theory with the scalar field as a nonminimally coupled complex field. Noether symmetry analysis is not only used to find a symmetry vector and potential but also it helps in finding an appropriate transformation $(a, \phi, \theta) \rightarrow (u, v, \theta)$ in the augmented space so that one of the new variables becomes cyclic. In quantum cosmology, the Wheeler-DeWitt (WD) equation has been formed in the minisuperspace and its solution i.e. the wave function of the universe has been evaluated by using the operator version of the conserved (Noether) charge. Finally, the nature of the classical solution has been discussed from the observational point of view and the cosmological singularity has been examined both classically and quantum mechanically.

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