Abstract

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Title: Classical and Quantum Cosmology from Various Gravity Theories: Noether Symmetry Approach.

The present research project deals with symmetry analysis to ordinary differential equations. Most specifically symmetry analysis will be applied to various cosmological models in the content of both Einstein gravity as well as modified gravity theory. For the space time geometry homogeneous and isotropic FLRW model will be used and as a result the evolution equations will be ordinary differential equations. Further, the evolution equations will be non-linear and coupled in nature. So in most of the cases it is not possible to have analytic solutions for the cosmological model. Moreover, the cosmological model contains various unknown parameter as well as unknown functions namely the coupling functions and potential of the scalar field. Symmetric analysis particularly the Noether symmetry analysis has an important role in this context. The Noether symmetry analysis not only simplifies the field equations but also give an analytic form for the unknown functions. Due to simplification of the evolution equations in most of the cases they become solvable. In particular, if it is possible to identify a cyclic variable in the augmented space then the Lagrangian as well as the field equations become in much simplest in form so that they are solvable. The Noether symmetry analysis gives conserved quantity corresponding to the physical problem. In quantization programme the operator version of the conserved charge shows the periodic part of the wave function of the Universe. Consequently, the Wheeler De-Witt equation may be in much simpler form and become solvable.

Finally, Causal interpretation will be used to identify quantum trajectory of various cosmological model and it is possible to examined whether classical singularity may be avoided or not by quantum description.

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