

Title: Symmetry Analysis in Differential Equations and Application to Cosmology.

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Abstract

The thesis consists of eight chapters. First chapter contains the introduction about symmetry analysis while in next six chapters my research works have been described. In this thesis we have mainly studied about the Noether's theorem and its applications. Here Noether symmetry analysis has been used to determine the classical solutions of various cosmological models. Here we have also discussed the Quantum cosmology for various dark energy models. Solving the Wheeler DeWitt (WD) equation we have found the wave function of the Universe for given cosmological models.

In second chapter, multiscalar field cosmological model has been studied using Noether symmetry approach. In this cosmological model, two minimally coupled scalar fields have been studied. The model is characterized by the coupling function and the potential function and they both depend on one of the scalar fields. These two functions are evaluated using Noether symmetry approach.

Third chapter contains the Chameleon field cosmological model which has been studied using Noether symmetry approach. Also quantum cosmology for this model has been studied. Constructing WD equation we have found the wave function of the Universe for this model.

In the fourth chapter, $f(T)$ -gravity theory has been discussed. Both classical and quantum cosmology have been studied here. Big- Bang singularity may be avoided for this model.

Fifth chapter is actually the extension of the second chapter where quantum cosmology has been studied for the double scalar field cosmological model. Using symmetries of the 3D augmented space, homothetic and killing vectors are determined.

The sixth chapter contains the Einstein-Skyrme model where the Wheeler DeWitt equation is constructed for studying quantum cosmology of the system and the wave function of the Universe is evaluated using the conserved Noether charge. This model shows a bouncing nature of evolution that is a singularity free model.

Seventh chapter analyze the Noether symmetry for a cosmological model with variable G and Λ . Using Noether symmetry analysis classical cosmological solutions for this model are obtained. Finally we have analyzed the solution of WD equation in the cosmological point of view.

Finally, the thesis ends with a brief discussion and future prospects of my work.

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