Abstract

In the thesis, the study deals, almost exclusively, with Fractional Di_erential Equations (FDEs) using an adaption of the symmetry approach developed and established by Lie for Di_erential Equations (DEs).

We study the nonhomogeneous inviscid Burgers' equation that arises in one-dimensional inviscid ow in the presence of external force. Inter alia, its applications are in optics: nonlinear _bre and geometrical, for example. We study a generalized form of this equation from Lie symmetry stand point. Reductions and invariant solutions are presented using the similarity variables thus obtained. To account for modeling of di_usion process by fractional time derivative, Lie symmetries and reduction of time-fractional inviscid Burgers' equation are also presented.

We investigate the vector _elds that arise from one-parameter Lie groups of transformations that leave invariant some classes of fractional nonlinear Schr¨odinger equation with nonlocal nonlinearity. Furthermore, the associated conserved ows are constructed.

We also study, similarly, the fractional time version of the nonlinear Schr odinger equation with power law using some recently developed approaches. We will show that the all important energy conservation due time invariance is lost due to some underlying property of the method.

We study the fourth-order KdV{Klein/Gordon equation. In particular, the fractional time evolution second-order Gordon type and fourth-order KdV{Klein/Gordon equations using the invariance approach when adapted to fractional PDEs. In the latter case, we show how conservation laws are constructed using the Lie symmetries. As usual, the conserved densities may be used to calculate conserved quantities.