Differentialequationsgovernmanynaturalphenomenaandplayanimportantroleintheprogressofengineeringandtechnology. Essentiallyalotofthefundamentequationsarenonlinearandingeneralsuchnonlinearequationsareoftenverydifficulttosolveexplicitly. Symmetrygrouptechniquesprovidemethods toobtainsolutionsoftheseequations. These methods have several applications in the studies of partial differential equation. They are also useful in the search for conservation laws which arises in manyfields of the applied sciences. Recentstudieshaveshownthatinfinitelymany nonlocal symmetries of various integrable models are related to their Lax pairs. Moreover symmetry method is one of the mostpowerful tools that give new integrable models fromknownones. Integrablemodelshavemust turbly important role in applied sciences and areoneofthecentral topics in soliton theory. In order to know if a system is integrable, it is very important to study Lax pairs of the system.

A symmetry can be considered as an equivalence transformationwhichleavesinvariantnotonlythedifferential structure of equation but also the form of the arbitrary elements. This fact made Ovsiiannikov search for equivalence transformations in a systematicway by using an algorithm based on the extension of the Lie infinitesimal criterion.

When an equation contains an arbitrary function, it reflects the individual characteristic of the phenomena belonging to a large class. In this sense, the knowledge of equivalence transformations can provide us with certainrelations between the solutions of different phenomena of the same class.

Nowadays severalbranches of the theoretical and applied sciences such as mathematics, physics, biology, economy, and finance rely on processes which are usuallymodeled by nonlinear differential equations. Often it is difficult to obtain reductions and exact solutions for these models. Our aim is to highlight applications of symmetry methods to nonlinear models in physics, engineering, and the applied science as well as to show recent theoretical developments in symmetry groups and geometric methods.

The authors of this special issue had been invited to submit original researcharticles as well as review articles in the following topics: advanced researches and theoretical analyses in group transformations and differential equations; Noether symmetries, applications, and conservation laws; numerical algorithms concerning the symmetry groups for partial differential equations; new and direct methods to obtain exact explicit solutions for differential equations; applications: novel applications in sciences, including engineering, physics, biology, and finance; and reviews: lucid surveys and review articles dealing with modern and classical topics.

However, we received 20 papers in these research fields. After a rigorous reviewing process, twelve articles were finally
accepted for publication. These articles contain some new and innovative techniques and ideas that may stimulate further researches in several branches of theory and applications of the transformation groups.

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