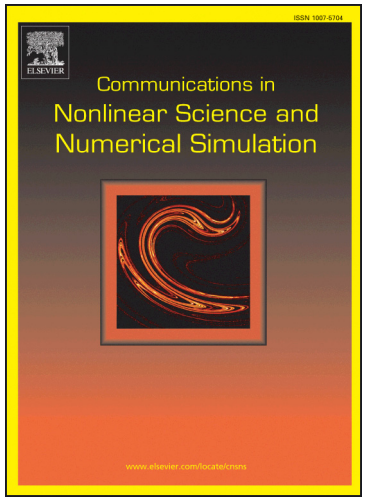

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Lie group analysis method for two classes of fractional partial differential equation *

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Abstract

In this paper we deal with two classes of fractional partial differential equation: n order linear fractional partial differential equation and nonlinear fractional reaction diffusion convection equation, by using the Lie group analysis method. The infinitesimal generators general formula of n order linear fractional partial differential equation is obtained. For nonlinear fractional reaction diffusion convection equation, the properties of their infinitesimal generators are considered. The four special cases are exaustively investigated respectively. At the same time some examples of the corresponding case are also given. So it is very convenient to solve the infinitesimal generator of some fractional partial differential equation.

Key words: Fractional partial differential equation, Lie group analysis, Infinitesimal generator, Modified Riemann-Liouville

1 Introduction

In recent years fractional partial differential equation has been widely concerned. Because the fractional partial differential equation can well describe the many complex phenomena, it has important applications in many fields such as physics, chemistry, biology and engineering. Therefore, to seek the solution of fractional partial differential equations is an important aspect of scientific research. At present, some effective methods have been put forward, such as the variational iteration method[1, 2], differential transform method[3, 4], Adomian decomposition method[5, 6, 7], the sub-equation method[8, 9, 10] and so on.

Lie group analysis method plays a significant role in studying the properties of differential equations and finding out the exact solutions. So some scholars apply Lie group analysis method to study the fractional differential equations and get some results [11, 12, 13, 14, 15, 16, 17, 18, 19, 20].

However invariant solution can be solved only for each specific equation in most existing literatures. Solving the infinitesimal generators is tedious in solving invariant solution process. That is to say, it is difficult to solve the determining equations.

In this article we try to deal with the following two classes of fractional partial differential equation.

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