

FINDING LIE SYMMETRIES OF PARTIAL DIFFERENTIAL EQUATIONS WITH **MATHEMATICA**[®]: APPLICATIONS TO NONLINEAR FIBER OPTICS

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Abstract. A **MATHEMATICA**[®] package for finding Lie symmetries of partial differential equations is presented. The package has been applied to perform a full Lie group analysis of basic models of nonlinear fiber optics. As a result of this group invariant solutions have been obtained. Comparisons with earlier published computer algebra implementations of the Lie group method are discussed.

1. Introduction

The Lie group method for establishing the transformations leaving a system of partial differential equations (PDEs) invariant can be found in many books on this subject [8, 11, 12]. The key to finding a Lie group of symmetry transformations is the infinitesimal generator of the group. In order to provide a bases of group generators one has to create and then to solve the so called determining system of equations (DSEs). The operations are straightforward but nonetheless formidably tedious to be done by hand. It is very frequent occurrence that hundreds of equations are manipulated when PDEs of order higher than two are considered and the independent variables are more than about two. In situations like this it is essential in our days the use of a contemporary computer algebra system, such as Reduce, **MATHEMATICA**[®], Maple, etc.