

# ABSTRACT

Lie group theory is a very practical and handy mathematical approach and it can be used to obtain solutions to diverse problems in applied mathematics. It's rich, very interesting and in broad sense a topic of active mathematical research. Efforts to obtain solutions to a variety of differential equations by use of Lie symmetry have been in existence for a long period of time. The numerical methods applied in obtaining solutions provide approximations which depend on certain initial and boundary conditions. This in itself is a limitation which can be dealt with by obtaining an analytical solution. Lie symmetry analysis approach to solve a fourth order wave equation which arises in studying the group properties of the linear wave equation in an inhomogeneous medium has been done. In this study we solved a harmonic fourth order non-linear ordinary differential equation using Lie Symmetry Group Invariant method. The methodology applied involved the use of infinitesimal generators, extended transformations, variation symmetries, adjoint-symmetries, integrating factors and the invariant transformations. This study obtained an analytic method for solving the harmonic fourth order non-linear equation. The result is of great significance in the field of mechanics.