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Lie Group Classification of a Generalized Coupled Lane-Emden-Klein-Gordon-Fock System with Central Symmetry

S. O. Mbusi [1], B. Muatjetjeja [2*] and A. R. Adem [1]

[1] *Department of Mathematical Sciences, North-West University, Mafikeng Campus, Private Bag X 2046, Mmabatho 2735, Republic of South Africa*
[2] *Department of Mathematics, Faculty of Science, University of Botswana, Private Bag 22, Gaborone, Botswana*

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Abstract: In this paper, we perform a complete symmetry analysis of a generalized Lane-Emden-Klein-Fock system with central symmetry. Several cases for the non-equivalent forms of the arbitrary elements are obtained. Moreover, a symmetry reduction for some cases is performed.

Keywords: *Lie group classification; equivalent transformation; Lie point symmetries; similarity reduction.*

Mathematics Subject Classification (2010): 35J47, 35J61.

1 Introduction

In the recent paper [1], the author investigated both the Lie and Noether symmetries of a Lane-Emden-Klein-Fock system with central symmetry of the form

$$\begin{aligned} u_{tt} - u_{rr} - \frac{n}{r}u_r + \frac{\gamma v^q}{r^n} = 0, \\ v_{tt} - v_{rr} - \frac{n}{r}v_r + \frac{\alpha u^p}{r^n} = 0, \end{aligned} \tag{1}$$

* Corresponding author: mailto:Ben.Muatjetjeja@mopipi.ub.bw