

ON COORDINATE EXPRESSIONS OF JET GROUPS AND THEIR REPRESENTATIONS

MIROSLAV KUREŠ

Department of Mathematics, Brno University of Technology, 61669 Brno, Czechia

Abstract. A detailed derivation of the jet composition in local coordinates for jet (differential) groups is presented. A suitable faithful representation in matrix groups is demonstrated. Furthermore, Toupin subgroups which occur in continuum mechanics are demonstrated as an example in which representations can be used effectively.

MSC: 58A20, 22E45

Keywords: Jet group, representation

1. Introduction

There are several well established geometrical theories providing a general description of variational problems of different kinds. One of the most universal and comprehensive is the calculus of variations on fibered manifolds and their jet prolongations. Using of jets is a very powerful tool, however it remains almost unknown to many physicists.

Our topic, jet groups, sometimes called differential groups, play an important role not only in the differential geometry, but especially in applications. Using these groups, the symmetries of differential equations are studied, and they are often used in various situations in the problems of contemporary physics. For practical calculations, however, it is necessary to really know the coordinate expressions, which are (more or less or completely) missing in the current literature.

In this paper, we will therefore try to close this gap and provide the necessary local expressions. Above all, we present matrix representations of jet groups by introducing both the method and several significant cases. We also present an interesting subgroup of the second order jet group that was studied in continuum mechanics.