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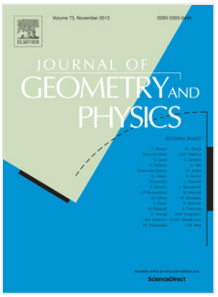

Geometric structures on solutions of equations of 3-dimensional adiabatic gas motion

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GEOMETRIC STRUCTURES ON SOLUTIONS OF EQUATIONS OF 3-DIMENSIONAL ADIABATIC GAS MOTION

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Abstract. In this paper, we show that characteristic covectors of a system of equations of 3-dimensional adiabatic gas motion generate a geometric structure on every solution of this system.

This structure consists of a hyperplane and a non degenerate cone in every cotangent space to a solution. These hyperplane and cone intersect in zero point only.

We construct differential invariants of this structure: a vector field, a conformal structure, a Lorentzian metric, and a linear connection.

In the case of polytropic gas motion, we calculate classes of explicit solutions possessing the linear connection with zero torsion.

1. Introduction

In this paper, we investigate some geometric structures naturally connected with a system of equations of 3-dimensional adiabatic gas motion. In addition, we apply these structures to find explicit solutions of the system.

We show that characteristic covectors of this system form a hyperplane and a non degenerate cone in every cotangent space to an arbitrary solution M of the system. These hyperplane and cone intersect in zero point only.

Further, we show that the field

$$S : m \longmapsto \mathcal{P}(m) \cup \mathcal{C}(m), \quad m \in M,$$

of these hyperplanes and cones on M can be considered as a section of some natural bundle over M. This means that S is a geometric structure on M.

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Key words and phrases. System of equation of 3-dimensional adiabatic gas motion, explicit solution, jet-bundle, natural bundle, geometric structure, Spencer δ-cohomology, differential invariant, linear connection, torsion tensor.

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