Advances on affine vector fields

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ABSTRACT.

Section 1 is introductory in nature [7], [8], while Section 2 contains our results. Section 1 presents certain results on affine mappings [7] and some notions about jet bundles [10]. All of these results are necessary to develop our theory in Section 2. Here we define the energy of a d-tensor field on the first order jet bundle and we prove that this energy is positively homogeneous of degree $m - p$ with respect to the partial velocities. Then the total derivative is used to introduce affine vector fields. We prove that these fields are tangent to the spherical bundle. Our main result (Theorem **??**) joins a symmetric tensor field, its associated energy and the affine vector fields into an original hyperbolic PDE.

REFERENCES

[1] Hall, G. S., Capocci, M. S. and Beig, R., *Zeros of conformal vector fields*, Class. Quantum Grav., **14** L49- L52 (1997), DOI: 10.1088/0264-9381/14/3/002

[2] Mishchenko, A. and Fomenko, A., *A Course of Differential Geometry and Topology*, Mir Publishers, Moscow, 1988

[3] Neagu, M., *Riemann-Lagrange Geometry on 1-Jet Spaces*, MatrixRom, Bucharest, 2005

[4] Pitea, Ariana, *Energies of tensor fields along affine mappings*, Bull. Transilvania Univ. Braşov, **14**(49)s./2007, 263-269

[5] Pitea, Ariana, *Integral Geometry and PDE Constrained Optimization Problems*, Ph. D. Thesis, "Politehnica" University of Bucharest, 2008

[6] Sharafutdinov, A., *Integral Geometry of Tensor Fields*, VSPBV, Utrecht, 1994

[7] Udrişte, C., *Convex Functions and Optimization Methods on Riemannian Manifolds*, Kluwer Academic Publishers, 1994

[8] Udrişte, C., Ferrara, M. and Opriş, D., *Economic Geometric Dynamics*, Geometry Balkan Press, 2004

[9] Udrişte, C., Pitea, Ariana and Mihăilă, Janina, *Kinetic PDEs on the first order jet bundle*, Proc. 4-th, Int. Coll. Math. Engng. & Num. Phys. (MENP-4), October 6-8, 2006, Bucharest, Romania, 195-208

[10] Udrişte, C. and Postolache, M., *Atlas of Magnetic Geometric Dynamics*, Geometry Balkan Press, 2001

[11] Vincze, Cs., *On geometric vector fields of Minkowski spaces and their applications*, Diff. Geom. Appl., **24** (2006), No. 1, 1-20

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