

A note on nonlinear connections on the cotangent bundle

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ABSTRACT.

In this paper the problem of compatibility between a nonlinear connection and some other geometric structures on the cotangent bundle of a manifold is studied. We prove that the notions of semi-Hamiltonian vector field on cotangent bundle and the metric nonlinear connection on tangent bundle are dual structures, via Legendre transformation.

REFERENCES

- [1] Anastasiei, M., *Finsler vector bundles – metrizable connections*, Period. Math. Hung. **48** (2004), 1-2, 83-91
- [2] Atanasiu, Gh. and Klepp, F. C., *Nonlinear connection in cotangent bundle*, Publ. Math. Debrecen **39** (1991), 1-2, 107-111
- [3] Bucătaru, I., *Metric nonlinear connection*, Diff. Geom. Appl. **25** (2007), 335-343
- [4] Crampin, M., *Tangent bundle geometry for Lagrangian dynamics*, J. Phys. A: Math. Gen. **16** (1983), 3755-3772
- [5] Crășmăreanu, M., *Metrizable systems of autonomous second order differential equations*, Carpathian J. Math. **25**, No. 2, 163-176 (2009)
- [6] Grifone, J., *Structure presque tangente et connexions I*, Ann. Inst. Fourier, **22** (1972), No. 1, 287-334
- [7] Hrimiuc, D. and Shimada, H., *On the L-duality between Lagrange and Hamilton Manifolds*, Nonlinear World **3** (1996), 613-641
- [8] Hrimiuc, D. and Popescu, L., *Nonlinear connections on dual Lie algebroids*, Balkan J. Geom. Appl. **11** (2006), No. 1, 73-80
- [9] Martinez E., Carinena J. F. and Sarlet W., *Derivations of differential forms along the tangent bundle projection II*, Diff. Geom. Appl. **3** (1993), No. 1, 1-29
- [10] Miron, R., *Hamilton geometry*, An. Stiinț. Univ. Al. I. Cuza Iași, S. I., Math. **35** (1989), 33-67
- [11] Miron R., Anastasiei M. and Ianuș, S., *The geometry of the dual of a vector bundle*, Publ. de l'Inst. Math. **46** (1989), 145-162
- [12] Miron R., Hrimiuc D., Shimada H. and Sabău, S., *The geometry of Hamilton and Lagrange spaces*, Kluwer Academic Publishers **118**, (2001)
- [13] Mitric, G., *Regular 1-forms and connections on the tangent and cotangent bundles*, Tensor **51** (1992), No. 3, 229-234
- [14] Mitric, G., *Connections and regularity on the tangent bundle*, An. Stiinț. Univ. Al. I. Cuza Iași. S. I., Math. **44** (1998), No. 2, 373-384
- [15] Mitric, G., *Connections and regularity on the cotangent bundle*, Publ. Math. Debrecen **55** (1999), No. 1-2, 141-154
- [16] Oproiu, V., *Regular vector fields and connections on cotangent bundle*, An. Stiinț. Univ. Al. I. Cuza Iași. S.I., Math. **37** (1991), No. 1, 87-104
- [17] Szilasi, Z. and Muzsnay, Z., *Nonlinear connections and the problem of metrizability*, Publ. Math. Debrecen **42** (1993), No. 1-2, 175-192
- [18] Yano, K. and Ishihara, S., *Tangent and cotangent bundles*, M. Dekker Inc., New-York, (1973)

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