(b) Variational foundations of Finsler geometry: Projective spaces, Grassmann bundles and the Hilbert form (D. Krupka)

Contents

- preliminaries (review): projective spaces, projectivized tangent bundles, jets, regular jets, differential groups, jet manifolds, Grassmannians,
- Grassmann fibrations, prolongations, adapted coordinates
- differential forms and vector fields; Zermelo homogeneity condition
- lifting of immersions, variational functionals on Grassmann fibrations
- variations, Lepage forms: generalizations to Grassmann fibrations
- first variation formula, extremals
- Invariant variational principles on Grassmann fibrations
- Finsler variational functionals, Finsler metrics
- higher-order generalizations
- The Hilbert form
- geodesics, geodesic equations
- examples and applications
- the inverse problem of the calculus of variations for Finsler structures

Key references

M. Krupka, Orientability of higher-order Grassmannians, Math. Slovaca 44 (1994), 107-115
General higher order Grassmannians $G^r_{n,m}$ introduced (of order $r$ and type $(n,m),\ n \leq m$); for $r = 1, n = 1$ (classical) projective space
Structure of higher-order Grassmann fibrations
Projective structures in Finsler geometry, Hilbert form
Global variational theory for 1-dimensional submanifolds, Lepage forms in this setting, complete basic theory
The Hilbert form - extension to higher order Lagrangians: fibered case