

93e:58045 58E30 58A15

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An exterior differential systems approach to the Cartan form.

Symplectic geometry and mathematical physics (Aix-en-Provence, 1990), 160–188, *Progr. Math.*, 99, Birkhäuser Boston, Boston, MA, 1991.

The author discusses the concepts of Poincaré-Cartan form, Lepagean equivalent, Dedecker's theory and Griffiths' formalism within the framework of Hermann's approach to constrained variational integrals. To be precise, let a fibration $\pi: M \rightarrow X^n$, a differential ideal I in the exterior algebra $C^\infty(\Lambda^*M)$, and an n -form \mathcal{L} on M be given. The variational problem $(M \xrightarrow{\pi} X, I, \mathcal{L})$ is to extremize the functional $\int_X \varphi^* \mathcal{L}$ over all sections $\varphi: X^n \rightarrow M$ which are solutions of I . Another variational problem of the kind $(W \xrightarrow{\rho} X, 0, \theta)$ with trivial differential ideal is called a Lepagean equivalent of the previous problem if there is a surjective submersion $\nu: W \rightarrow M$ such that $\rho = \pi \circ \nu$ and $\gamma^* \theta = (\nu \circ \gamma)^* \mathcal{L}$ for all solutions $\gamma: X \rightarrow M$ of I . Then θ is taken as a generalization of the Poincaré-Cartan form and the crucial question concerns the correspondence between extremals of these variational problems. A concept of regularity then naturally appears.

Reviewer's remarks: More general ideas involving the boundary constraints, Hamiltonian theories, singular variational problems, and other subjects were developed in a book by the reviewer [MR 91f:58024 Formal calculus of variations on fibered manifolds, Univ. J. E. Purkyne, Brno, 1989; MR 91f:58024] and in the series of preliminary papers. In particular, the "Griffiths formalism" was proposed for multidimensional problems about 1980.

For the entire collection see MR 92k:58004.

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