Critical points at infinity in the variational calculus: An overview

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Abstract:

The standard contact structure α_0 of S^3 has a vector-field v defining a Hopf fibration in its kernel. Legendre transform w.r.t v can be performed. Symmetric Hamiltonian problems are thereby transformed into their Lagrangian counterparts. It was believed that the existence of such a v was special to this framework. This belief turns out to be wrong. V. Martino has produced a vector-field in the kernel of the first contact form α by J.Gonzalo and F.Varela such that $d\alpha(v,\cdot)$ is also a contact form with the same orientation than α. This provides a new textbook example in Contact Form Geometry. We will describe in our talk the first contact form of J.Gonzalo and F.Varela and the vector-field v in its kernel by V.Martino; we will study the related dynamics and the related Reeb vector-fields periodic orbit problems at the light of the homology for contact forms/structures that we have defined in our work.

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