

Linearization of the isotropy subalgebra of a transitive Lie algebra of vector fields

M. Zhitomirskii, Technion, Haifa

Let \mathcal{A} be a finite-dimensional Lie algebra of vector field germs at $0 \in \mathbb{R}^n$ which contains vector fields $\partial/\partial x_i + h.o.t.$, $i = 1, \dots, n$ (such algebras are called transitive) and let $\mathcal{I} = \{V \in \mathcal{A} : V(0) = 0\}$ be the isotropy subalgebra of \mathcal{A} . The linear approximations at 0 of the vector fields of \mathcal{I} form a Lie algebra $j^1\mathcal{I}$. Assume that $\dim \mathcal{I} = \dim j^1\mathcal{I}$ so that $j^1\mathcal{I}$ is a faithful representation of \mathcal{I} in $gl(n)$. Under which condition \mathcal{I} and $j^1\mathcal{I}$ are diffeomorphic, i.e. can be sent one to the other by a local diffeomorphism of \mathbb{R}^n ? I will discuss this question from various points of view and will formulate and explain some unexpected theorems, for example that \mathcal{I} and $j^1\mathcal{I}$ are diffeomorphic if $\dim \mathcal{I} = \dim j^1\mathcal{I} = 1$, without any restrictions on the eigenvalues of vector field which span \mathcal{I} .