NGUYEN HUU DUC
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INVOLUTIVE SINGULARITIES

BY NGUYEN HUU DUC

Abstract

Involutive varieties can be found in many problems of differential geometry, calculus of variations, D-module theory and mathematical physics. The aim of this note is to present some problems concerning singularities of germs of involutive varieties and to discuss some recent results in this topic.

1. Involutive Analytic Set

A symplectic structure on a manifold M is a closed non-degenerate 2-form ω and this manifold is called a symplectic manifold.

Darboux theorem says that on a symplectic manifold M there exists a local coordinate system so called canonical coordinate system $(p_1, .., p_n; q_1, .., q_n)$, such that the symplectic structure of M is of the following form

$$\omega = \sum_{i=1}^{n} dp_i \wedge dq_i.$$

Exemple 1. Let Q be a complex analytic manifold. Then its cotangent bundle T^*Q is a symplectic manifold with $\omega = d\tilde{\alpha}$, where α is a Liouville form. In the local coordinates $\tilde{\alpha}$ can be written in the form

$$\tilde{\alpha} = \sum_{i=1}^{n} p_i dq_i,$$

where $p_1, .., p_n$ (resp. $q_1, .., q_n$) are coordinates of Q (resp. cotangent coordinates).

An automorphism of a symplectic manifold M is said to be symplectic if it preserves the symplectic structure of M.

Let f be a symplectic automorphism of T^*Q. We say f is strongly symplectic if f preserves a Liouville 1-form $\tilde{\alpha}$.

Remark. In [W], Weinstein proved that a symplectic automorphism is strongly symplectic iff it is a cotangent map of some automorphism of Q.

An automorphism Φ of $M \times T$ is said to be the deformation of a (strongly) symplectic automorphism h of M if $\Phi(x, t) = (h_t(x), t)$ where h_t are (strongly) symplectic

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