Plan

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My research area is 「Geometry of differential systems」. We continue to study this direction. My plan consists of the following two research themes.

1. Differential systems with symmetries.

Among differential systems, there exist systems which have rich symmetries (automorphisms). As a such a typical category, we can give 「Parabolic geometry」. Roughly speaking, parabolic geometries (in the sense of N.Tanaka) are geometries associated with simple graded Lie algebra $\mathfrak{g}$ over $\mathbb{R}$ or $\mathbb{C}$, where these graded algebras are defined by the discussion of (restricted) roots of $\mathfrak{g}$:

$$\mathfrak{g} = \mathfrak{m} \oplus \mathfrak{p}, \qquad (\mathfrak{p} : \text{parabolic subalgebra}).$$

Then, our research objects are corresponding geometric structures of manifolds M (dim M =dim G/P) which have the model geometry on compact quotient G/P. For these objects, there exists the invariant theory (i.e. Tanaka theory) consisting of Cartan connections and their curvatures. We want to give deep results of these geometries based on this theory.

2. Differential systems with singularities.

In this research, in contrast to the above case, we study singularities of differential systems in extensive sense. For second order PDEs, we studied some problems until now. Among them, we can give the formulation of geometric solution of second order PDEs from a view point of contact geometry of second order. Among this solutions, there exists a notion of singular solutions. For these singular solutions, in fact we researched the Ansatz to construct and gave the explicit construction (integral representations) for typical examples by using the theory of prolongations ([5], [6]). However, for singular solutions, it is important to discuss some geometric properties more deeply. Moreover, we will also consider differential systems which have singularties not only solutions, but also equations.