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 the research of geometry of differential systems, many of obtained results are given under a certain regularity condition. For instance, parabolic geometries associated to simple graded Lie algebras and Tanaka theory are formulated under the regularity condition for nilpotent graded Lie algebras (symbol algebras). In this research, in contrast to the above case, we study singularities of differential systems in extensive sense. In particular, we want to discuss the theory of the construction of solutions for non-regular differential equations. Moreover, we clarify the type-changing phenomenon of solutions of these equations.