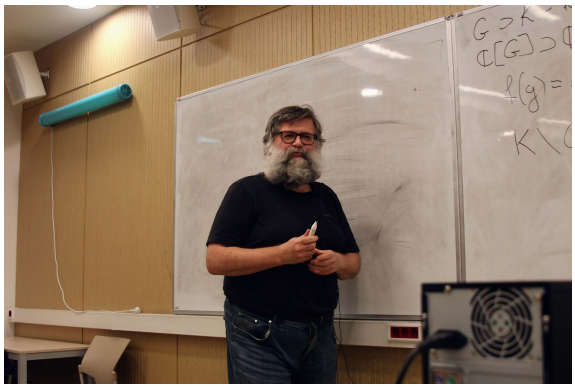

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Non-holonomic distributions and families of nilpotent Lie algebras

The main objective of this research visit to the University of Bergen was to work together with professor I. Markina on fields of nilpotent Lie algebras related to non-holonomic distributions. My main interest is the study of Lie algebras and their Lie groups, where I published several works. Professor I. Markina works in sub-Riemannian geometry, i.e., geometry of non-holonomic distributions equipped with a Riemannian metric on each plane V_x of the distribution.

We consider a p-dimensional non-holonomic distribution V_x in an n-dimensional complex linear space. Then in each point of $\mathbb{C}^n$ we have a $\mathbb{Z}_{>0}$-graded nilpotent Lie algebra N_x, which is canonically defined up to an isomorphism. It is known that generally, it depends on a point $x \in \mathbb{C}^n$, see for instance the results of V.Ya.Gershkovich, who showed this for distributions in general positions. In other words, parameters of algebras N_x are functions in variables of a point x. It is not much is known about such dependence. A number of parameters can be quite large: for various types of distributions, it can have asymptotics $c \cdot n^3$ for some positive constants c. On the other hand, number of functional parameters determining the distribution is $p(n-p)$. Parameters as functions on x satisfy certain non-linear systems of partial differential equations with constant coefficients. It is interesting to find explicitly such equations. For instance, if a distribution has codimension 3, then the corresponding Lie algebras are enumerated by projective curves equipped with two-dimensional vector bundles.

During the visit, we had numerous discussions with Professor I. Markina and her doctoral student R. Langøen. As a part of the visit, I participated in the conference "Lie groups, geometry, integrability, hydrodynamics"which took place on July 01-06 at Nordfjordeid.

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