

Research Project

Automorphisms of Algebraic Varieties and Vector Fields

Third-party funded project

Project title Automorphisms of Algebraic Varieties and Vector Fields

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Organisation / Research unit

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Department

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Status Completed

This research proposal is a continuation of the previous project with the title "Automorphism Groups of Varieties: Geometry, Combinatorics, and Representations". The main object is the automorphism group $\text{Aut}(X)$ of an affine algebraic variety X , i.e. the group of regular automorphisms of X . A lot is known for curves X , but almost nothing in higher dimension. The only case studied more carefully is the affine Cremona group $\text{Aut}(\mathbb{A}^n)$, the automorphism group of affine n -space $\mathbb{A}^n = \mathbb{C}^n$. In particular, the automorphism group of the plane \mathbb{A}^2 got a lot of attention in recent years; it also appears in some of our research projects.

One of the fundamental questions can be expressed as follows.

Basic Problem. How much information about the structure of the affine variety X can be retrieved from the automorphism group $\text{Aut}(X)$?

The group $\text{Aut}(\mathbb{A}^n)$ has the structure of an ind-variety, i.e. an infinite dimensional variety in the sense of Shafarevich. This group will serve as a model and "test case" for our general studies. We have recently shown that for every affine variety X the automorphism group $\text{Aut}(X)$ admits a canonical structure of an ind-group.

One of the main tools is to study the Lie algebra $\text{Lie Aut}(X)$ which is sitting in the Lie algebra $\text{Vec}(X)$ of vector fields on X . A basic question is the relation between closed connected subgroups $G \subset \text{Aut}(X)$ and their Lie algebra $\text{Lie } G \subset \text{Lie Aut}(X)$. For example, the Lie algebra Vec

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