EFFECTIVE METHODS IN AFFINE AND BIRATIONAL GEOMETRY

KAROL PALKA

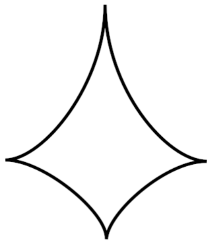

Figure 1. Algebraic curve with 4 cusps and no self-intersections.

The project lies in the area of algebraic geometry, which is the field of mathematics that studies solutions to polynomial equations such as $x + x^2y + z^2 + t^3 = 0$. Solutions of the equation create interesting and complicated spaces, so-called *algebraic varieties*. Studying their shapes helps to see properties that are hard to see when using pure algebra, and consequently helps to solve equations.

The methods developed by algebraic geometry in the last few decades allow to combine algebraic varieties into various groups according to their shapes and numerical features. The overall goal of our research is to study the structure of algebraic varieties and the relationships between them.

We pay a lot of attention to minimal varieties, especially convex ones. They are particularly important building blocks from which other varieties are built. We want to describe possible shapes of minimal convex surfaces (called del Pezzo), plane-like ($\mathbb{Q}$-acyclic) surfaces and some of their higher-dimensional analogues. For instance, after removing from the plane the curve shown in the figure we get an example of such a surface.