Seminari de Geometria Algebraica 2016-2017

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On blowing up the weighted projective plane

Antonio Laface

Universidad de Concepción

Let $\mathbb{P}(a,b,c)$ be the weighted projective plane with pairwise coprime weights a,b,c, defined over an algebraically closed field $\mathbb{K}$ of characteristic 0. This talk will focus on the Cox ring of the blowing-up $X = X(a,b,c)$ of $\mathbb{P}(a,b,c)$ at a general point x_0. The Cox ring of X is the following $\mathbb{Z}^2$-graded algebra [1]:

$$\mathcal{R}(X) = \bigoplus_{(d,-m)\in\mathbb{Z}^2} \left\{ f \in \mathbb{K}[x_1,x_2,x_3]_d \;:\; \substack{V(f)\subseteq\mathbb{P}(a,b,c)\text{ has}\\ \text{multiplicity }\geq m\text{ at }x_0} \right\},$$

where $\mathbb{K}[x_1,x_2,x_3]_d$ denotes the vector space of degree d homogeneous polynomials with respect to the $[a,b,c]$-grading. The aim of this talk is to present a criterion for testing if $\mathcal{R}(X)$ is finitely generated and to show for which values of a,b,c the Cox ring is generated by homogeneous elements of multiplicity at most 2. The proof of the criterion makes use of a theorem of Hu and Keel [3, Proposition 2.9], while for providing explicit generators of the Cox ring we apply [2, Algorithm 5.4].

This is joint work with J. Hausen and S. Keicher, `https://arxiv.org/abs/1608.04542`

[1] Ivan Arzhantsev, Ulrich Derenthal, Jürgen Hausen, and Antonio Laface, *Cox rings*, Cambridge Studies in Advanced Mathematics, vol. 144, Cambridge University Press, Cambridge, 2015.

[2] Jürgen Hausen, Simon Keicher, and Antonio Laface, *Computing Cox rings*, Math. Comp. **85** (2016), no. 297, 467–502.

[3] Yi Hu and Sean Keel, *Mori dream spaces and GIT*, Michigan Math. J. **48** (2000), 331–348.

Universitat de Barcelona — Universitat Politècnica de Catalunya BarcelonaTech — Universitat Autònoma de Barcelona