SEMINARIO

Carlos Abad Reigadas

Universidad Autónoma de Madrid

Multiplicity and finite morphisms

Abstract: Let X be a variety over a perfect field k. The multiplicity is an invariant that stratifies X into locally closed sets. X is regular at a point ξ if and only if $\mathrm{mult}(\xi) = 1$. Dade proved that, if

$$(1) \qquad X \leftarrow X_1 \leftarrow \cdots \leftarrow X_l$$

is a sequence of blow-ups along closed regular equimultiple centers, then

$$\max \mathrm{mult}(X_l) \leq \max \mathrm{mult}(X).$$

If one can find a sequence like (1) so that $\max \mathrm{mult}(X_l) < \max \mathrm{mult}(X)$, then a resolution of singularities of X can be constructed by iteration of this process.

The study of the multiplicity has been historically linked to that of finite morphisms. Zariski's formula says that, if $\beta : X' \to X$ is a finite and dominant morphism of varieties of generic rank r, then

$$(2) \qquad \max \mathrm{mult}(X') \leq r \cdot \max \mathrm{mult}(X).$$

Let $\underline{\mathrm{Max}}\mathrm{mult}(X)$ denote the stratum of maximum multiplicity of X. When the equality holds in (2), $\underline{\mathrm{Max}}\mathrm{mult}(X')$ is homeomorphic to its image in X, which is contained in $\underline{\mathrm{Max}}\mathrm{mult}(X)$. In our work, we study conditions under which

$$\beta\big(\underline{\mathrm{Max}}\mathrm{mult}(X')\big) \cong \underline{\mathrm{Max}}\mathrm{mult}(X),$$

and such that this homeomorphism is preserved by *permissible* blow-ups. These conditions provide a relation between the processes of lowering of the maximum multiplicity of X and X' by blowing up equimultiple centers.

This is a joint work with Ana Bravo and Orlando Villamayor.

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Web: http://www.imuva.uva.es
Correo Electrónico: imuva@uva.es