

(Relative)A1-Contractibility of Smooth Affine Schemes over a Dedekind base

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In 1935 Whitehead published a purported proof on Poincaré conjecture unveiling an homotopical obstruction to unique characterization of \mathbb{R}^n among open contractible n -manifolds. However, it is now a fact that for all $n > 2$, \mathbb{R}^n is the unique open contractible n -manifold that is simply connected at infinity. The analogous question in algebraic geometry is to characterize the affine n -space among smooth A1-contractible affine schemes. With much novelty, this is proven in affirmation in dimensions $n < 3$ over fields. This question is largely open for surfaces in positive characteristics and it utterly breaks down in higher dimensions.

In this talk, we will upgrade this characterization to a Dedekind base by establishing a connection between the motivic homotopy theory and the classical affine algebraic geometry. To this end, we will see that over Dedekind scheme S , the affine n -space forms a Zariski torsor under an \mathbb{A}^n -bundle for $n < 3$ and a vector bundle if S is affine. With further hypothesis, we can retrieve a similar characterization as that of fields.

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