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Title:Extension Theorems in Vector Spaces over Finite Fields

We study the boundedness of the extension operator associated with algebraic varieties such as nondegenerate quadratic surfaces, paraboloids, and cones in vector spaces over finite fields.

We obtain the best possible result for extension theorems related to nondegenerate quadratic curves in two dimensional vector spaces over finite fields. In higher even dimensions, we improve upon Tomas-Stein exponents which were obtained by Mockenhaupt and Tao by studying extension theorems for paraboloids in the finite field setting.

We also study extension theorems for cones in vector spaces over finite fields. We give an alternative proof of the best possible result for extension theorems for cones in three dimensions, which originally is due to Mockenhaupt and Tao. Moreover, our method enables us to study the boundedness of the extension operator for cones in higher dimensions.

In addition, we study the relation between extension theorems for spheres and the Erdos-Falconer distance problems in the finite field setting. Using the sharp extension theorem for circles, we improve upon the best known result by A. Iosevich and M. Rudnev for the Erdos-Falconer distance problems in two dimensional vector spaces over finite fields.

Discrete Fourier analytic machinery, arithmetic considerations, and classical exponential sums play an important role in the proofs.