Some motivation for this definition is provided by the following theorem, which will allow us to apply the results of this paper to a common setting for distance problems. Throughout, we will use $\mathbb{F}_q$ to refer to the unique finite field with q elements for some prime power q, and we will let $\mathbb{F}_q^d$ be a d-dimensional vector space over this field.

Theorem 1.2 (A. Iosevich and M. Rudnev (2007) [4]). *Let* $X = \mathbb{F}_q^d$, $D = \mathbb{F}_q$, *and define* $d($

Proof.

those vertices of degree $< s$. By construction, the maximum degree of vertices in H is less than s, which means H

To see this, let L be the set of leaves of G. Then since G is a tree which is not a star graph, $G - L$