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Discrete orderings in the real spectrum. (English) Zbl 07238990

Summary: We study discrete orderings in the real spectrum of a commutative ring by defining discrete prime cones and give an algebro-geometric meaning to some kind of diophantine problems over discretely ordered rings. Also for a discretely ordered ring $M$ and a real closed field $R$ containing $M$ we prove a theorem on the distribution of the discrete orderings of $M[X_1, \ldots, X_n]$ in $\text{Spec}_R(R[X_1, \ldots, X_n])$ in geometric terms. To be more precise, we prove that any ball $B(\alpha, r)$ in $\text{Spec}_R(R[X_1, \ldots, X_n])$ with center $\alpha$ and radius $r$ (defined via Robson’s metric) contains a discrete ordering of $M[X_1, \ldots, X_n]$ whenever $r$ is positive non-infinitesimal and $\alpha$ is at infinite distance from all hyperplanes over $M$.

MSC:
03H15 Nonstandard models of arithmetic
14P99 Real algebraic and real-analytic geometry

Keywords:
discretely ordered ring; real spectrum

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References:
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