**Zbl 656.05039**
**Avis, David; Erdős, Paul; Pach, János**
*Repeated distances in space.* (In English)
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Let $X = \{x_1, x_2, ..., x_n\}$ be a set of $n$ points in $R^d$, $d \geq 2$, and let $R = \{r_1, r_2, ..., r_n\}$ be a set of $n$ positive real numbers. The repeated distance graph $G_d(X, R)$ is the directed graph on the point set $X$ with edges $(x_i, x_j)$ whenever $d(x_i, x_j) = r_i/d$ denotes Euclidean distance.

The authors present bounds on the maximum number of edges that $G_d(X, R)$ can have. In addition, it is shown that

$$\frac{n^2}{4} \quad + \quad \frac{3n}{2} \quad \leq \quad f(3, d) \quad \leq \quad \frac{n^2}{4} \quad + \quad \frac{3n}{2} \quad + \quad 255,$$

where $f(3, d)$ is the maximum number of edges of $G_3(X, R)$ in which $r_i = \max_{i \neq j} d(x_i, x_j)$ holds.

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Classification:
05C35 Extremal problems (graph theory)
05C20 Directed graphs (digraphs)
05C38 Paths and cycles

Keywords:
furthest neighbor graph; repeated distance graph