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Multidimensional linear congruential graphs. (English) Zbl 0883.68101

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Summary: Let d be an integer, F be a finite set of d-dimensional linear functions and $\vec{s}=(s_1,s_2,\dots,s_d)$, be a d-dimensional vector of positive integers. We define graph $G(F,\vec{s})$, called a linear congruential graph of dimension d as a graph on the vertex set $V=Z_{s_1}\times Z_{s_2}\times\cdots\times Z_{s_d}$, in which any $\vec{x}\in V$ is adjacent to the vertices $f_i(\vec{x}) \bmod \vec{s}$, for any f_i in F.

These graphs generalize several well known families of graphs, e.g. the de Bruijn graphs, chordal graphs, and linear congruential graphs. We show that, for a properly selected set of functions, multidimensional linear congruential graphs generate regular, highly connected graphs which are substantially larger than linear congruential graphs, or any other large family of graphs of the same degree and diameter. Some theoretical and empirical properties of these graphs are given and their structural properties are studied.

MSC:

68R10 Graph theory (including graph drawing) in computer science

Keywords:

linear congruential graph; Bruijn graphs; chordal graphs

Full Text: DOI EuDML

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