

Combinatorial Orthogonal Graphs

Sean Bailey*, Dave Brown, LeRoy Beasley, Utah State University

Vectors $x = (x_1, x_2, \dots, x_n)^T$ and $y = (y_1, y_2, \dots, y_n)^T$ are *combinatorially orthogonal* if $|\{i : x_i y_i \neq 0\}| \neq 1$. An undirected graph $G = (V, E)$ is a *combinatorial orthogonal graph* if there exists $f : V \rightarrow \mathbb{R}^n$ such that for any $u, v \in V$ $uv \notin E$ if and only if $f(u)$ and $f(v)$ are combinatorially orthogonal. We will show that every graph has a combinatorial orthogonal representation and determine the minimum dimension necessary to generate such representation for specific classes of graphs.

Keywords: dot product graphs, combinatorial orthogonal, graph representations