1079-05-178 **Sarah Anderson*** (sarah5@g.clemson.edu), **Hiren Maharaj** and **Jeong-Hyun Kang**.
Distance graphs on $\mathbb{Z}^n$ with l_1 norm.

Let $G = (\mathbb{Z}^n, D)$ be a graph such that $x, y \in \mathbb{Z}^n$ are adjacent if and only if $||x - y||_{l_1} \in D$, where $D = \{r \mid 1 \leq r \leq d-1\}$ for $1 \leq d \leq n$. We show $\chi(G) \geq \frac{2^n}{A(n,d)}$, where $A(n,d)$ denotes the maximum possible size of a binary code of length n and minimum Hamming distance d. These results can be generalized by considering $G = (\mathbb{Z}^n, D)$, where $D = \{d \mid d < d_1 \text{ or } d_2 < d \leq n\}$ for $1 \leq d_1 \leq d_2 \leq n$. We define a $(n, [d_1, d_2])$-code to be the set $\mathcal{C} \subset \{0,1\}^n$ such that for all $x, y \in \mathcal{C}$, $d_1 \leq d(x,y) \leq d_2$. We show $\chi(G) \geq \frac{2^n}{A(n,[d_1,d_2])}$, where $A(n,[d_1,d_2])$ denotes the maximum size of a $(n,[d_1,d_2])$-code. We examine codes in spherical caps, $Z(n,[0,\phi])$, to find an upper bound for $A(n,[d_1,d_2])$. In fact, if $n \geq 2d_2 + 1$, then $A(n,[d_1,d_2]) \leq A_Z(n,\theta,\phi')$, where $A_Z(n,\theta,\phi')$ denotes the maximum size of a θ-code in a spherical cap, $Z(n,[0,\phi'])$, $\cos(\theta) = 1 - \frac{2d_1}{n}$, and $\cos(\phi') = \frac{\cos(\phi)}{\sqrt{1/A(n,[d_1,d_2]) + \cos(\theta)}}$, where $\cos(\phi) = 1 - \frac{2d_2}{n}$. (Received January 11, 2012)