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Erdős, Paul; Chen, Robert W.
Random walks on Z_2^n. (In English)
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Let Z_2^n be the set of all $(a_1, a_2, \ldots, a_n)$ such that $a_i = 0$ or $a_i = 1$ for all $i = 1, 2, \ldots, n$. Further let $(W_t^n)_{t\geq 0}$ be a random walk on Z_2^n such that $P(W_0^n = A) = 2^{-n}$ for all A in Z_2^n and such that, given $a_1, a_2, \ldots, a_n$, the next transition is equally probable to $(a_2, a_3, \ldots, a_n, 0)$ or $(a_2, a_3, \ldots, a_n, 1)$.
This paper studies the behaviour of the random time C_n taken by the random walk to visit all states in Z_2^n. The main result is

$$P(c_2^n 1n(2^n) < C_n < d2^n 1n(2^n)\text{a.e.}) = 1, \quad \text{for all constants } c < 1 < d.$$

We note that $(W_t^n)_{t\geq 0}$ is not the usual random walk in the sense that two (and not any neighboured) vertices are chosen with the same probability. (Also the walk permits jumps in the "diagonal", see e.g. $n = 3$). The latter has been studied before by *P. C. Mathews* [Covering problems for random walks on spheres and finite groups. Tech. Rep. 234, Dept. of Statistics, Stanford Univ. (1984)] and the results turn out here to be similar, but the technique used in this paper is different.

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Classification:
60J15 Random walk
60F20 Zero-one laws
60G50 Sums of independent random variables

Keywords:
Borel-Cantelli lemma; covering time