Domination in Tensor Product of Path Graphs

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The domination number of a graph G is a metric for describing the connectivity of a graph through the lens of control. We observe the domination number of the tensor product of path graphs. We examine the disconnected nature of the tensor products of path graphs, and analyze the structure of I_n, O_n, and E_n, which are graphs that represent some of the connected components for each tensor product of path graphs. In particular, we define constructions and tilings over tensor products of these graphs to find upper and lower bounds for their domination numbers, as well as potential configurations for minimal dominating sets of these graphs. We show that as n grows, you only need roughly $\frac{1}{5}$ of the vertices in $P_n \times P_n$ to dominate it, or that $\lim_{n\to\infty} \frac{\gamma(P_n \times P_n)}{|V(P_n \times P_n)|} = \frac{1}{5}$. Similarly we obtain an analogous bound for total domination, $\lim_{n\to\infty} \frac{\gamma_t(P_n \times P_n)}{|V(P_n \times P_n)|} = \frac{1}{4}$.

Keywords: Domination, Tensor Products, Path Graphs, Kronecker Product