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Distanced Eternal Domination on Graphs

Eternal domination in a graph is a dynamic process which protects a graph from an infinite sequence of vertex attacks. In eternal k-domination, a set of guards seeks to protect the graph using a distance k dominating set. There is an attack that occurs and the guards move positions up to distance k, to cover the attacked vertex, subsequently another attack occurs and they must move from their present positions. The minimum size of a set such that the graph can be protected from attacks indefinitely is called the eternal k domination number of the graph, denoted $\gamma^{\infty}_{all,k}(G)$. In this talk, we will focus on the case where $k = 2$, and detail the result for the case of perfect m-ary trees of depth d. For such graphs T:

$$\gamma^{\infty}_{all,2}(T) = 1 + \frac{m^d - 1}{m^2 - 1}$$

In general, the computation of this parameter is not known for most graphs, and determining if a set is an eternal k-dominating set is a difficult problem. Other results will be discussed, and open problems towards a reduction on trees will be presented.