

Improvements on the Bounds of Percolation Threshold for Archimedean Lattices of Degree 5

Henry Chen*, John Wierman, John Hopkins University

For an infinitely large graph G , the site percolation threshold p is the probability such that if every node on the graph is open with probability p , the probability of the existence of an infinitely large connected cluster of open nodes approaches 1.

In 1990, Wierman developed a substitution method for improving bounds on percolation thresholds by comparing problem lattices with ones with known percolation thresholds or bounds on their thresholds by proving a stochastic ordering between the partitions of boundary vertices of isomorphic subregions. In this work, we apply the dual stage substitution method to Archimedean lattices with nodes of degree at least five. We will provide a justification for the general case of the dual substitution action, as well the potential impact on substitution region pairings. Finally, we will discuss potential substitution regions to be explored given appropriate time and computing power.

Keywords: Percolation thresholds, stochastic orderings, posets, partitions, substitution method