Finding an Optimal Hitting Set of a Fixed Size for Special Graphs

Abstract

Given a graph G with n nodes, we would like to find the optimal hitting set of size k, where k is a constant, given that the random walk follows some probability transition matrix P. Although the decision version of this problem is NP-complete, this paper explores the problem on specific graphs. It first provides a polynomial time algorithm for computing the optimal hitting sets on line and cycle graphs. It then extends these algorithms to the tadpole graph. The paper then provides a polynomial time algorithm for computing the optimal hitting sets of any tree that contains a constant number of nodes with degree larger than two. The algorithm first partitions the tree into disjoint line graphs, and then uses the algorithm for the line graph to determine the optimal set. Finally, this paper will introduce a greedy approximation algorithm and provide an example to show that it is not a 2-approximation for trees.