CSE421: Design and Analysis of Algorithms May 16, 2024

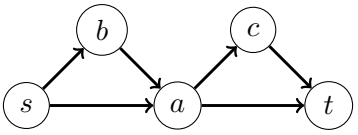
Shayan Oveis Gharan Problem Solving Session 7

P1) A domino is shape like  or  . Given an $n \times n$ table where some of the squares are removed (in the picture below removed squares are marked with an X), design a polynomial time algorithm that outputs the maximum number of dominos that can be placed on the table which are not overlapping and don't cover any X cells.

For example, given the table on the left the maximum number of dominos that can be placed is 2.

X		
		X
	X	

P2) Given an (unweighted) directed graph $G = (V, E)$, a pair of vertices s, t and an integer $1 \leq k \leq n$. Design an algorithm that runs in time polynomial in n, k and outputs yes if there are k *vertex* disjoint paths from s to t and no otherwise. For example, in the following graph there are two edge disjoint paths from s to t but no two vertex disjoint paths from s to t.



For this problem you can assume you have access to a polynomial time algorithm for the edge disjoint path problem defined as follows: Given a directed graph G and a pair of vertices s, t we want to find the maximum number of edge disjoint paths from s to t. Two paths P_1, P_2 from s to t are edge disjoint if they don't share an edge. We will discuss the solution to this problem in class on Friday.