Due: 6 pm on Wednesday, March 26

Assignment 5

1 Textbook Exercises

5.9, 5.10

2 Minimizing Kendall tau distance

Given m rank lists denoted as $P_1, P_2, \ldots, P_m$, each of which is a permutation of integers from 1 to n. We want to find an aggregation rank list S which is also a permutation of integers from 1 to n, and minimizes the *Kendall tau distance* between S and $P_1, P_2, \ldots, P_m$.

Kendall tau distance is defined as:

$$K(S; P_1, P_2, P_3, \ldots, P_m) = \sum_{k=1}^{m} |\{(i,j) \mid \text{rank}(i, P_k) < \text{rank}(j, P_k) \text{ and } \text{rank}(i, S) > \text{rank}(j, S)\}|$$

where $\text{rank}(i, P)$ represents the rank of i in permutation P. Please use the **branch-and-bound** method to solve this problem and provide **complexity analysis**.

3 Circuit Routing

As shown in Figure 1, the printed circuit board (PCB) divides the wiring area into an $m \times n$ grid array. We want to determine the shortest routing scheme connecting the grid **a** to the grid **b**. To avoid crossing lines, the grid with already routed wires has been marked as blocked (as shown in **1** in Figure 1), and other lines are not allowed to pass through the blocked grid. When routing, the circuit wires can only be routed in a straight line or at a right angle. Please use the **branch-and-bound** method to solve this problem, explain the specific process, and analyze the **time complexity** of the algorithm (worst case).

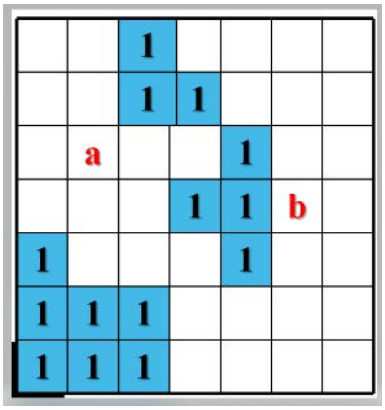

Figure 1: PCB routing example