APPENDIX

A. MCMF algorithm

Algorithm 1 MCMF algorithm

Input: $G = (V, E, C, W, s, t)$
Output: Minimum cost $minCost$ and maximum flow f
  Initialize flow $f \leftarrow 0$
  Initialize cost $minCost \leftarrow 0$
  repeat
    $path \leftarrow$ find an augmenting path from source s to sink t
    if $path \neq \varnothing$ **then**
      $rc \leftarrow$ calculate the minimum residual capacity on $path$
      $f \leftarrow f + rc$
      $minCost \leftarrow minCost + (rc \times W(path))$
    end if
  until $path = \varnothing$
  return $minCost, f$

Algorithm 1 describes the process of the MCMF algorithm, which solves the problem by searching for augmenting paths and gradually increasing the flow. The input to the algorithm is a directed graph $G = (V, E, C, W, s, t)$, where V denotes the set of nodes, E denotes the set of edges, C denotes the set of each edge's capacity, W denotes the set of each edge's cost, s denotes the source node, and t denotes the sink node. The output of the algorithm is the minimum cost $minCost$ and the maximum flow f. The time complexity of this algorithm is O(N^2M), where N denotes the count of nodes and M denotes the count of edges.