Fundamental Algorithms, Assignment 13

Not to be Submitted!

What is the fastest, cheapest and most efficient way to get from point A to point B? That consumes him, and all parts of his life.
– Sean Stanton on Travis Kalanick, Uber CEO

1. Suppose that we are doing Dijkstra's Algorithm on vertex set $V = \{1, \ldots, 500\}$ with source vertex $s = 1$ and at some time we have $S = \{1, \ldots, 100\}$. What is the interpretation of $\pi[v], d[v]$ for $v \in S$? What is the interpretation of $\pi[v], d[v]$ for $v \notin S$? Which v will have $\pi[v] = NIL$ at this time. For those v what will be $d[v]$?

2. Suppose, as with Dijkstra's Algorithm, the input is a directed graph, G, a source vertex s, and a weight function w. But now further assume that the weight function only takes on the values one and two. Modify Dijkstra's algorithm – replacing the `MIN-HEAP` with a more suitable data structure – so that the total time is $O(E + V)$.

3. Let G be a `DAG` on vertices $1, \ldots, n$ and suppose we are *given* that the ordering $1 \cdots n$ is a Topological Sort. Let `COUNT[i,j]` denote the number of paths from i to j. Let s, a "source vertex" be given. Give an efficient algorithm (appropriately modifying the methods of the chapter) to find `COUNT[s,j]` for all j.

A clever man commits no minor blunders. – Goethe