Homework #3: Due 9/5/17 by 11:55pm*

1. Write pseudocode for MAKE-SET, FIND-SET, and UNION using the linked-list representation and the weighted-union heuristic. Make sure to specify the attributes that you assume for set objects and list objects.

   Solution. Your solution here.

2. Let $G = (V, E)$ be a weighted, directed graph with weight function $w \colon E \to \mathbb{R}$. Give an $O(EV)$-time algorithm to find, for each vertex $v \in V$, the value $\delta^*(v) = \min_{u \in V} \{\delta(u, v)\}$. Assume that there is no negative-weight cycle in G.

   Solution. Your solution here.

3. Let $G = (V, E)$ be a weighted, directed graph with weight function $w \colon E \to \{0, 1, \ldots, W\}$ for some nonnegative integer W. Modify Dijkstra's algorithm to compute the shortest paths from a given source vertex s in $O(WV + E)$ time.

   Solution. Your solution here.

4. Let $G = (V, E)$ be a weighted, undirected graph with weight function $w \colon E \to \{1\}$, with two vertices $s, t \in V$. Give an $O(E)$-time algorithm to find the number of the shortest paths from s to t.

   Solution. Your solution here.

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*Last update August 30, 2017