CS170 Fall 2013 Solutions to Homework 7

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1. (20 pts.) A greedy algorithm - so to speak

We can formalize this as a graph problem. Let the undirected graph $G = (V, E)$ denote LinkedInâĂŹs relationship graph, where each vertex represents a person who has an account on LinkedIn. There is an edge $\{u, v\} \in E$ if u and v have listed a professional relationship with each other on LinkedIn (we will assume that relationships are symmetric). We are looking for a subset $S \subseteq V$ of vertices so that every vertex $s \in S$ has edges to at least 20 other vertices in S. And we want to make the set S as large as possible, subject to these constraints. Design an efficient algorithm to find the set of super-schmoozers (the largest set S that is consistent with these constraints), given the graph G.

1. Color each vertex arbitrarily

2. Let $B := \{v \in V : v \text{ is bad}\}$

3. While $B \neq \emptyset$:

4. Pick any bad vertex $v \in B$

5. Reverse the color of v.

6. Update B to reflect this chang, so that it again holds the set of bad vertices.

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2. (20 pts.) A funky kind of coloring

Let $G = (V, E)$ be an undirected graph where every vertex has degree ≤ 51. Let's find a way of coloring each vertex blue or gold, so that no vertex has more than 25 neighbors of its own color.

Consider the following algorithm, where we call a vertex 'bad' if it has more than 25 neighbors of its own color:

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3. (10+5 pts.) Shortest path in currency trading

4. (5+5+5+5 pts.) Cycle property, another MST algorithm

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5. (5+5+5+5 pts.) Update MST after changing one edge

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Problem 6

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