CS2040S: Data Structures and Algorithms

Discussion Group Problems for Week 4

For: Sept. 2–Sept. 6, 2019

Problem 1. Ranking Players

The residents of planet Kronos compete in an annual "*tlhIngan IH qaD*" contest for honor, glory, and wealth. The contest rules are rather complicated, but involves comparing contestants and teams of contestants. As part of the Intergalactic Federation, you and Naruto are hired to help program the software to manage the contest.

There are N contestants, each with a certain proficiency level. Initially, each contestant is in his/her own team, but teams can be merged. The proficiency of a given team is the *maximum* proficiency among all the contestants in the team. For this problem, you can assume you already have access to all the algorithms and data structures we have discussed in class. Unless you make a modification, you do not have to describe how the standard methods work.

Problem 1.a. Given a contestant x, we often have to remove the most proficient contestant from the team x is in, and output the new proficiency of the team. **What data structure is most relevant for this problem and how can you use it to solve the above problem?** State the time complexity of your method.

Problem 1.b. Next, given two contestants x and y, merge the teams that x and y are in, and output the proficiency of the merged team. **What is the most time efficient algorithm and associated data structure(s) you can think of for solving this task?** State the time complexity of your method.

Problem 2. Cookie Selection

Next, we will attempt the *Cookie Selection* problem on Kattis:

`https://nus.kattis.com/problems/cookieselection`

We'll save paper and not replicate the rather long problem description here. Please view it on Kattis.