CS 180 Homework 1
Due Friday, July 3, 2020

**Problem 1** (25 pts). What is the difference between an algorithm and a program?

**Problem 2** (75 pts). Men, women and yupi live on the planet Alphaomega. Their family pattern is a triple that consists of a man, a woman and a yupi. Three sets are given: M includes $n$ men, $W$ includes $n$ women and $Y$ includes $n$ yupi. A matching is a set $H$ of ordered triples of the form $(m, w, y)$ with the property that each member of $M$, each member of $W$ and each member of $Y$ appears in at most one triple from $H$. A matching $H$ is called *perfect* if each member of $M$, each member of $W$ and each member of $Y$ appears exactly in one triple from $H$.

Assume that each man ranks all women and all yupi, each woman ranks all men and all yupi, and each yupi ranks all women and all men.

Two triples $(m, w, y)$ and $(m', w', y')$ form an instability in a matching $H$ if one of the following conditions is true:

1. $m$ prefers $w'$ to $w$ and $w'$ prefers $m$ to $m'$
2. $m$ prefers $y'$ to $y$ and $y'$ prefers $m$ to $m'$
3. $y$ prefers $w'$ to $w$ and $w'$ prefers $y$ to $y'$

A matching $H$ is called *stable* if it does not have instabilities.

Decide whether the following statement is true or false.

*There is an algorithm that solves the Stable Matching Problem for every instance of this problem.*

If it is true, design an algorithm for building a stable perfect matching. Note that when you design an algorithm, you have to prove that it solves the necessary problem.

If it is false, give a counterexample.