CSCI 561: Foundations of Artificial Intelligence

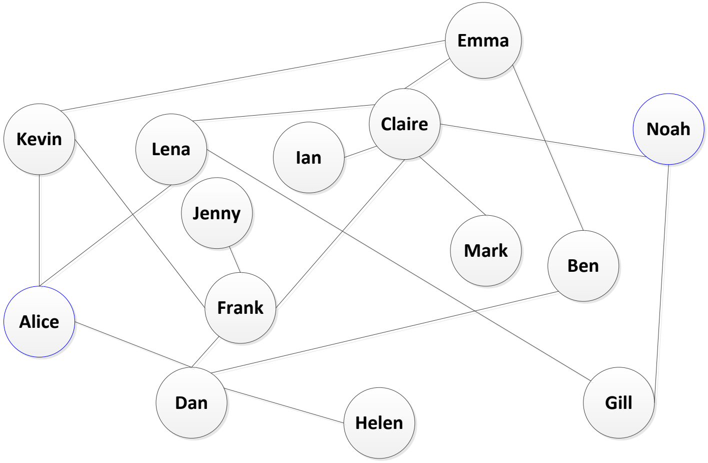
Instructor: Prof. Laurent Itti

Homework #2: Greedy and A* Search

Due on March 11 at 11:59pm, Los Angeles time, 2013

In this assignment, you will continue with the same message delivery problem in social network. You are asked to implement Greedy and A* searches to help ***Alice*** choose a path to successfully send the message to ***Noah*** in an efficient way.

Recently, ***Alice*** has tried selecting several paths to send the message. But unfortunately, they all failed to reach ***Noah***. By carefully examining the social contacts of each person, ***Alice*** found there have been some changes. Some peoples are not friends any more. It happens when there has been conflict of interest between two people, or simply the relationship between them has changed. The following figure shows the updated social network:



The expert friend of ***Alice*** suggested applying a heuristic to send the message to reach ***Noah***. By assuming each person may have her/his own channel to reach ***Noah***, he mined the social network and computed the time it might cost for each person to reach ***Noah*** directly, and the accompanying risk of disclosing the message as well. We refer to those two values as **direct time** and **direct risk**.

You will need to write a program to implement the following search algorithms, to help ***Alice*** find optimal traversal path(s) to send her message to reach ***Noah***.

1. Greedy search
   - Using **direct time** as the heuristic (25 pts)
   - Using **direct risk** as the heuristic (25 pts)
2. A* search
   - Using time as cost (same as HW1) and **direct time** as the heuristic (25 pts)
   - Using risk as cost (same as HW1) and **direct risk** as the heuristic (25 pts)

Input:

1. You are provided with a file social-network-updated.txt (which is an updated version of social network based on that of HW1). Each line describes the reaction time for the

recipient to forward the message, and the risk of disclosing the message as well. A sample line would be:

Lena Claire 17 39.

This represents that it takes 17 hours for ***Claire*** to react and forward the message if ***Lena*** send the message to ***Claire***. The risk of disclosing the message is 39 while sending the message between them. Please note that you may assume the friendship is mutual, so it also takes equal amount of time to send the message from ***Claire*** to ***Lena***. It also applies to the risk value.

2. You are also provided with direct-time-risk.txt, which describes the time it may cost for each person to reach ***Noah*** directly and the accompanying risk of disclosing the message. A sample line would be:

   Kevin 258 52

   This represents that it might take 258 hours for ***Kevin*** to reach ***Noah*** directly, and the accompany risk of disclosing the message is 52.

Output: The program should output the nodes (separated by "-") in the order that show the path of forwarding the message. For example, Alice-Lena-Claire-Noah.

There should be four .txt output files for all algorithms (one for each algorithm).

1. Greedy.time.result.txt
2. Geedy.risk.result.txt
3. A-star.time.result.txt
4. A-star.risk.result.txt

Suggestion: To make sure your program outputs the right results. You may compute each result manually and compare it with that of your program.

Deliverables:

1. You are required to hand in concisely documented code that implements the specified program, and your output files as well. Please include a readme.txt that describes how to compile and execute your code, as well as any comments you may have. Please turn in all materials as a **.zip** file via the **Blackborad** by **11:59pm, Mar. 11, 2013** with the title format [firstname]_[lastname]_HW2.zip (e.g., Mark_Zuckerberg _HW2.zip).
2. Implementation language is not important. You are free to choose the one that you feel most comfortable with. However, if you code in C, C++, C#, or Java, the TA will be better able to assist you ☺.