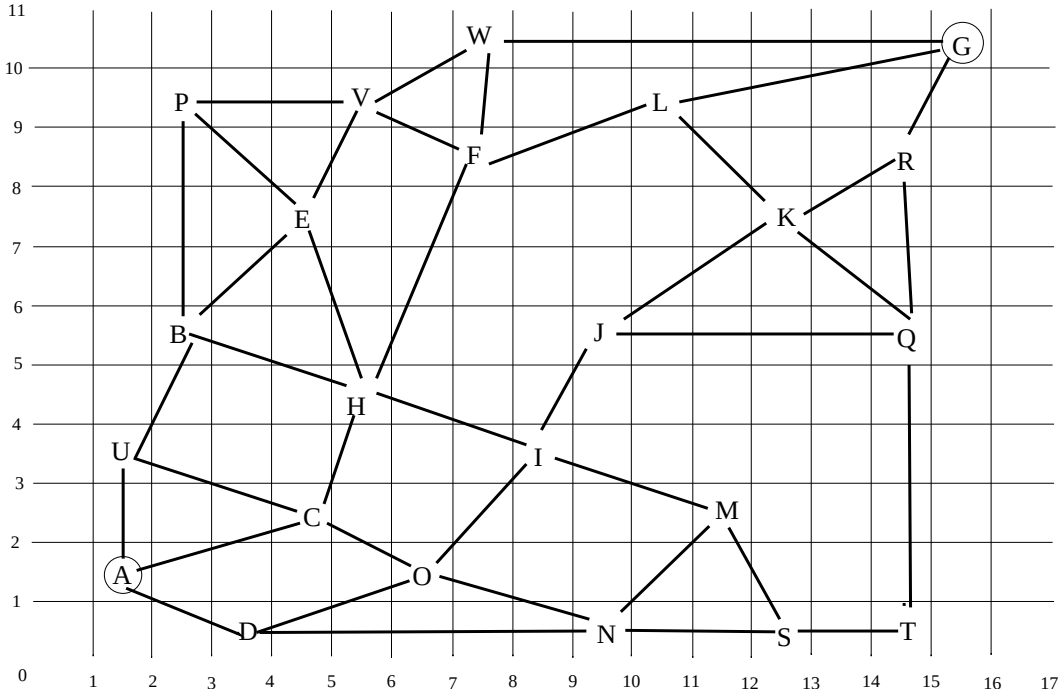
CIS 630 Lab #1

Due: Oct 26, at class meeting.

In a small town live 23 families, $A, B, ..., W$, which happen to be on an integer coordinates (x, y). These homes are linked by direct lines as shown in the map below. The distance between two homes is the length of straight line if the two homes are connected, and is infinity otherwise. For example, $d(A, D) = \sqrt{(3-1)^2 + (0-1)^2} = \sqrt{5}$, and $d(A, H) = \infty$. Suppose we want to search for a shortest path from home A to a home G using three heuristic search algorithms. That is, the algorithms order the OPEN list in increasing order of $f(s) = g(s) + h(s)$. In each algorithm $g(s)$ is the total distance traveled from town A to the current node s. The algorithms use different heuristic functions $h(s)$.



1. In A_1, the heuristic function $\hat{h}_1(s)$ is the horizontal distance between node s and the goal G. For example, $\hat{h}(c) = |15 - 4| = 11$.

2. In A_2, $\hat{h}_2(s)$ is the vertical distance between node s and the goal G.

3. In A_3, $\hat{h}_3(s)$ is the straight line distance between node s and the goal G. E.g.$\hat{h}_3(C) = \sqrt{(15-4)^2 + (10-2)^2}$.

Write a program to implement the three algorithms. Each algorithm should output two lists:

1. The homes from A to G in the orders that they are **visited** according to the algorithm.

2. The homes from A to G in the path found by the algorithm.

You should think a way of representing the graph data structure. You should also print and submit a hardcopy of the code. You may use whatever programming language.

Answer the following questions after the coding:

1. Which of the three algorithms is (are) admissible A^*? Among the three which algorithm is most informed? For admissible A^* algorithms, do they find the optimal path?

2. Is the set of nodes searched by the most informed algorithm a subset of the nodes searched by the other two algorithms.