# Homework Assignment 4

## (500 points + Bonus points)

## Assigned Date: Tuesday, October 21, 2008

## Due Date:

## Phase I: 4:00 PM Tuesday, November 4, 2008

## Phase II: 4:00 PM Thursday, November 20, 2008

### Educational Goal

Become familiar with various search strategies.

### Requirements

- Use two different search strategies to solve Traveling Salesman Problem.
- Give n cities, find a complete tour to visit each city exactly once with minimal length (you do not need to go back to the start city). Cities are numbered 0,…,n-1 (n is the number of cities for the problem); moreover, you can assume that all cities are connected with the cost of traveling from one city to another city being defined by a cost function defined as follows:

  cost(x,y)= if x=y then 0

      else if x+y>30 then |x-y|

      else if x+y>15 then $(|x-y|^2)+10$

      else   2*|x-y|+10

- Run your programs using values for n=20 and n=40, respectively. Your programs must report the best solutions found, their cost, and time spent. Reporting false results or solutions that were not obtained by running your programs is an academic honesty violation.
- **(100 points) Phase I:** Submit your solutions for n=20 using one search strategy of your choice. We will run your program for up to 10 minutes at TA's machine (Intel Core 2 Duo 2.0GHz with 2GB Ram). Your program will either finish the job within 10 minutes, or we will abort the program. In the latter case, it is recommended that your program report intermediate results whenever it is possible.

- **(400 points) Phase II:** Submit your solutions for n=40 using a different search strategy from what you have done in Phase I. We will run your program for up to 30 minutes at TA's machine. Your program will either finish the job within 30 minutes, or we will abort the program. In the latter case, it is recommended that your program report intermediate results whenever possible.
- **Phase II:** based on your experimental results, write a one-page report with minimum 200 words to discuss the design of search strategies and any interesting experiences or lessons learned in this assignment.
- **Bonus Points:** 50 bonus points for the student who finds the cheapest path in Phase I (25 for the $2^{nd}$, 10 for the $3^{rd}$ place), and 100 bonus points for the student who finds the cheapest path in Phase II (50 for the $2^{nd}$, and 20 for the $3^{rd}$ place).

## Submission Requirements

1. Follow the language requirements for programming assignments posted at http://www.cs.umb.edu/~ding/classes/470_670/student.htm
2. Your program should be well-documented. Variable names and function names should be self-descriptive. Major functions should be explained clearly in comments.
3. Turn in the paper copy and soft copy of all the files **including your program code and results of at least one successful run**. Submit **a single zipped file** of all the files of this assignment through your UMassOnline account at http://boston.umassonline.net/index.cfm. Submit the paper copy along with the cover page in class. Paper copy should be bound firmly together as one pack (for example, staple, but not limited to, at the left corner). 5 points will be deducted for unbounded homework.
4. Name your file with AI_ lastname_firstname_hw4_phaseNumber. For example, student John Smith should name his file as AI_Smith_John_hw4_I.zip.
5. No hard copies or soft copies results in 0 points.