CSCI 4560/6560 Evolutionary Computation

Assignment Number 2: Due Tuesday 9/27/2005 **(in class)**

1. **[50 points]**

   The Subset-sum problem is stated as follows. Given a set of N positive integers $X = \{x_1, x_2, \ldots, x_n\}$ and an integer S. Find a subset P of the set X such that the sum of the elements of P is equal to S. For example, if N=5, S=21 and the set $X = \{12, 17, 3, 24, 6\}$, the set $P = \{12, 3, 6\}$ is a valid solution for the Subset-sum problem in this example.

   Use a genetic algorithm (or any evolutionary algorithm) to solve the Subset-sum problem. You should generate random integers for the set elements and the target sum S but make the target sum at least half of the sum of all the elements or the problem will be too easy. You may download and use an existing GA or implement your own. You should try to solve the problem for the highest possible value of N that your program can handle in a reasonable amount of time. Turn in a printout of your code and your solutions. If you use an existing package, you should only turn in a printout of the parts you modify/introduce, such as the fitness function.

2. **[50 points]**

   The Traveling-salesman problem is stated as follows. Given a set of N cities, find a tour that minimizes the total distance traveled while visiting all the cities and returning to the point of origin. In this assignemnt you should use the locations of the cities in the file:

   `www.cs.uga.edu/~khaled/ECcourse/TSPDATA.txt`

   and use Euclidean distance. The file has 127 cities, with the X and Y coordinates of each city given.

   Use an evolutionary algorithm to solve the traveling salesman problem. You may download and use an existing EA or implement your own. You should try to find the shortest tour among the cities. The shortest known tour has length 118282. Turn in a printout of your code and your solutions. If you use an existing package, you should only turn in a printout of the parts you modify/introduce, such as the fitness function.

Note:

- A large collection of GA and evolutionary computation packages can be downloaded from **http://www.aic.nrl.navy.mil/galist/src/**
- Since this is the first assignment, a program that works correctly and solves the problem for some reasonable value of N will earn at least 80% of the grade regardless of optimality.
- Since students will use different machines in different environments, getting a solution for a higher value of N will not be a critical factor in evaluation. However, using intelligent operators and/or strategies will earn more credit.

- You can use the same program (with some modifications) to solve both the subset-sum and the Traveling-salesman problems. The only part that **needs** to be different is the fitness function. On the other hand, if you choose to write two different programs you are welcomed to do so as long as you finish in time.