

CEE512 Logistics Systems Analysis  
**Homework Handout Set #3**

1. In class we covered the capacitated fixed-charge facility location problem. Rewrite the model formulation to account for a fixed number of possible facility types (e.g., small, medium, large) that can be built at each site. Each type has a certain capacity and a location-dependent fixed cost. Define the parameters, decision variables clearly.
2. We now focus on the simpler uncapacitated fixed-charge facility location (UFL) problem. The attached Excel file “data49points.xls” contains the x- and y-coordinates of 49 points in a 10-by-10 square, each of which is both a demand point and a candidate location for facility construction. The Excel file also contains the facility construction cost and the demand at each point. The distance between any two points can be measured by the Euclidean metric. Suppose the costs are properly prorated such that the objective is to minimize (total facility costs) + 75\*(total demand-distance). Complete the following tasks.

Implement the Lagrangian relaxation solution algorithm to solve the UFL problem instance with these 49 points. You may relax any constraints from the problem. You may use any programming language of your choice (e.g., C++, C#, MATLAB, VBA). Please report the best solution (number and location of facilities) found, the remaining optimality gap (if any), the computation time, and the computer platform used. Please plot the convergence process (upper bound and the best lower bound) over iterations. Please also submit your algorithm source code.