Problem Solving

Homework #3

Due: Apr-17 (Wed.) (before 03:00pm)

Instruction:

a. You have 2 problems in this homework.

b. Submit your report at the class on Apr-17.

c. Any work that you turn in should be your own.

d. Any late submission will not be accepted.

Problem #1. Pipeline (10 pts)

We have discovered N oil fields, and we plan to construct a pipeline network. Our main pipeline should be constructed in parallel to the latitude lines (west to east), and each oil field is connected to the main pipeline by a pipeline perpendicular to the main one. Given N positions $P_i(x_i, y_i)$ for $1 \leq i \leq N$, design an algorithm to determine the position of the main pipeline $y = m$ that minimizes the total length of pipelines.

Problem #2. Connectivity (10 pts)

We have two buildings A and B, and they are very far from each other. On the top of each building, there are N terminals. We also have N electrical wires between two buildings such that one terminal of each wire is in the building A and the other terminal is in the building B. You need to identify the connectivity among the terminals. You can only use a battery, a light bulb, and electrical wires. Design an algorithm to find all connectivity while minimizing the number of travels between buildings. You should explain 1) the number of travels and 2) detailed instruction to check the connectivity.