CSE 3101: Design and Analysis of Algorithms

Assignment 5b Do not submit - solutions will be posted soon

Harder problems on Dynamic Programming

Problems:

1. Clickomania: `http://acmicpc-live-archive.uva.es/nuevoportal/data/p4564.pdf`
2. Gerry mandering (Problem from "Algorithm Design" by Tardos and Kleinberg).

   Political parties like to carve out electoral districts in ways so as to lead to outcomes that favor the party. This is called gerrymandering.

   Suppose there are n precincts $P_1, \ldots, P_n$, each containing m registered voters. We are supposed to divide the precincts into 2 districts, each containing $n/2$ of the precincts. For each precinct we have information on how many voters are registered to each of two political parties. Suppose for simplicity that each voter is registered to one of the parties. We say that the set of precincts is susceptible to gerrymandering if it is possible to perform the division into 2 districts in such a way that the same party holds a majority in both districts.

   Example: Suppose we have 4 precincts with the following information on registered voters. If we group precincts 1 and 4 in one district, and precincts 2 and 3 in the other, then party A would have a majority in both districts.

Precinct	1	2	3	4
number of voters registered for party A	55	43	60	47
number of voters registered for party B	45	57	40	53

   Give an algorithm to determine whether a set of precincts is susceptible to gerrymandering.

   $i = n, j = n/2$ and $k > 0$.
3. Elevator scheduling (Problem taken from Programming Challenges. by Revilla and Skiena)

   An elevator in a building is VERY slow. In order to speed up travel times, n riders agree to have the elevator make at most k stops. They want to minimize the total number of floors people have to walk either up or down. What floors must the elevator stop at?