Cs445 — Homework #5
Dynamic Programming

Due: 4 April 2007 during class meeting.

Instructions. All assignments are to be completed on separate paper. Use only one side of the paper. Assignments will be due at the beginning of class. To receive full credit, you must show all of your work. All questions have the same value.

1. Run the LCS algorithm to find the LCS of $X =$ "$ABBACCBA$" and $Y =$ "$BABCA$". Show how you are using the the dynamic programming table, and how you are reconstructing from this table the LCS itself.

2. Show how to compute $\text{LCS}(X, Y)$ using memory $\Theta(\min\{|X|, |Y|\})$ and time $O(|X| \cdot |Y|)$

3. You are given two strings X and Y, with m and n characters resp. Both strings are above the alphabet Σ. You are also given an array $Cost$ that specifies for each character $c \in \Sigma$ the **cost** of c.

   Suggest an $\Theta(n^2)$ time algorithm that finds the a common subsequence of X and Y, such that the sum of costs of the characters that appears in Z is as large as possible. Here $n = |X| = |Y|$.

4. Let n be an **even integer**. Give an example of strings X and Y for which there are $\Omega(2^{n/2})$ different common subsequences of X and Y, both of maximal length. Assume n is an even number.

5. Use the matrix multiplication algorithm to find the optimal way to compute A_1A_2, A_3, A_4 where $d_0 = 10, d_1 = 10, d_2 = 20, d_3 = 30, d_4 = 40$.

6. Run the edit distance algorithm on the following example: $X =$ "$ABBACCBA$" and $Y =$" $BABCA$".