COMP122: Algorithm and Analysis

Supplementary Notes on Dynamic Programming

Lecture for Thursday, December 1, 2005

```
For L = 2,
    i goes from 1 to (n - L + 1)
      (j is set according to i + L - 1)
      Find m[i,j] by iterating through all k values ( i <= k < j)


For L = 3,
    i goes from 1 to (n - L + 1)
      (j is set according to i + L - 1)
      Find m[i,j] by iterating through all k values ( i <= k < j)


    .
    .
    .
    .
    .
    .


For L = n,
          ... same process ...
```

NOTE: If a subchain of length L starts at i, then $j = i+L-1$ and $j \leq n$. This implies $i \leq n-L+1$. Therefore, i runs from 1 to $n - L + 1$.

Example for Chain Matrix Multiplication:

```
m[1,1] = m[2,2] = m[3,3] = m[4,4] = 0  (Lines 2-3 of Matrix-Chain-Order)


For L = 2,

           m[1,2] = 5 x 4 x 6 = 120
           m[2,3] = 4 x 6 x 2 =  48
           m[3,4] = 6 x 2 x 7 =  84


For L = 3,

                       / m[1,1] + m[2,3] + 5 x 2 x 4 =  88 \
           m[1,3] = min                                        =  88
                       \ m[1,2] + m[3,3] + 5 x 2 x 6 = 180 /


                       / m[2,2] + m[3,4] + 4 x 7 x 6 = 252 \
           m[2,4] = min                                        = 104
                       \ m[2,3] + m[4,4] + 4 x 7 x 2 = 104 /


For L = 4,

                       / m[1,1] + m[2,4] + 5 x 7 x 4 = 244 \
           m[1,4] = min  m[1,2] + m[3,4] + 5 x 7 x 6 = 414   = 158
                       \ m[1,3] + m[4,4] + 5 x 7 x 2 = 158 /
```