CS325 - Project 3

Group #6
William Jernigan, Alexander Merrill, Sean Rettig

November 19, 2014

Correctness

Equation 1

Given an array with an index starting at 0.

$$T[i,j] = max \left\{ \begin{array}{l} A[i,j] \\ T[i-1,j] + A[i,j] \\ T[i,j-1] + A[i,j] \end{array} \right\}$$

Base Cases:
$T[i,j] = NaN$ if $i < 0$ OR $j < 0$

$$X[i,j,n_{row},n_{col}] = max \left\{ \begin{array}{l} T[i,j] \\ X[i-1,j,n_{row},n_{col}] \\ X[i,j-1,n_{row},n_{col}] \end{array} \right\}$$

Base Cases:
$X[i,j,n_{row},n_{col}] = NaN$ if $i < n_{row} - 1$ AND $j < n_{col} - 1$; $\forall n_{row}, n_{col}$

$$Z[n_{row},n_{col}] = X[n_{row},n_{col},n_{row},n_{col}]$$

$Z[n_{row},n_{col}]$ returns the score of the optimal solution given an $n_{col} \times n_{row}$ grid A.

Pseudocode

```
load A[x,y] with values on board
initialize ybest, xbest, T[x,y] with 0
initialize P[x,y] with pointer to A[x,y]
for i = 0 ... y
    for j = 0 ... x
        T[i,j] <- A[i,j]
        if i > 0
            if T[i-1,j] + A[i,j] > T[i,j]
                T[i,j] <- T[i-1,j] + A[i,j]
                P[i,j] <- pointer to A[i-1,j]
        if j > 0
            if T[i,j-1] + A[i,j] > T[i,j]
                T[i,j] <- T[i,j-1] + A[i,j]
                P[i,j] <- pointer to A[i,j-1]
        if T[i,j] > T[ybest,xbest]
            ybest <- i
            xbest <- j
point.y <- ybest
point.x <- xbest
while point.y != -1 AND point.x != -1
    concat point with path
    point <- P[point.y,point.x]
```

Running Time

$\Theta(n_{col} * n_{row})$
Populating the DP table just requires looping over the length and width of the grid, or $n_{col} * n_{row}$.