Memory Mapping of Array

Question: Given a 2D array A[10][20], find the memory location of A[6][15] if loc(A[0][0])=100. Assume column-wise memory is allocated in the double type.

Solution:

Here,
$l_1 = 0$, $u_1 = 9$, $l_2 = 0$, $u_2 = 19$
b = 100, i = 6, j = 15, L = 8
M = 10, N = 20

For column major:
$addr(a[i, j]) = b + (j - l_2)*M*L + (i - l_1)L$

Hence,
$addr(A[6][15]) = 100 + (15 - 0)*10* 8 + (6 - 0)*8$

$= 1348$ **(Ans)**

Question: Find the memory location of A[70][60] if loc(A[20][15])=10000. Assume row-wise memory is allocated in the floating point type array A[80][100], where each float data is 4 bytes.

Solution:

For row major:

addr(a[i, j]) = b + (i – l_1)*N*L + (j – l_2)*L

At first, we need to calculate the base for A[20][15]:

l_1 = 0, u_1 = 79, l_2 = 0, u_2 = 99

b = ??, i = 20, j = 15, L = 4

M = 80, N = 100

Hence,

10000 = b + (20 – 0)*100*4 + (15 – 0)*4

b = 10000 – 8060

b = 1940

For A[70][60]:

l_1 = 0, u_1 = 79, l_2 = 0, u_2 = 99

b = 1940, i = 70, j = 60, L = 4

M = 80, N = 100

Hence,

addr(A[70][60]) = 1940 + (70 – 0)*100*4 + (60 – 0)*4

= 30180 **(Ans)**