Documentation: assignment7

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1 Summary of Problem Specification

1.1 Abstract

To find the location of an element of a two dimensional array of type *double* in memory, given the base address of the array.

1.2 Formulae

The formuale to calculate the element address of a two dimensional array were given in class were:

1. Element Address = Base Address + Offset
2. Offest = $j(n_{bytes}) + i(n_{bytes}{*}col_{size})$

where i is the number of the row entry (zero indexed), j is the number of the row entry (zero indexed), n_{bytes} is the number of bytes that the data type allocates (our example uses *double*, thus our n_{bytes} will be eight), and col_{size} is the number of entries in a column (stated a different way, the number of rows).

Converting to Hexadecimal

When I'm forced to deal with converting between bases, I typically result to using an iterative form of division. I divide the number I want to convert from by the given base, take the result of the division, and begin to divide again. This process terminates when the dividend becomes smaller than the divisor (in this case, the base). At each step, it is important to note of the remainder. An example follows:

Convert 2675 from base 10 to base 16

1. 26799/16 = 1674 with remainder 15 (this is our least significant bit)
2. 1674/16 = 104 with remainder 10
3. 104/16 = 6 with remainder 8
4. 6/16 = 0 with remainder 6 (this is our most significant bit)
5. $26799 = 6 \times 16^3 + 8 \times 16^2 + 10 \times 16^1 + 15 \times 16^0$
6. $26799 = 68\text{AF}_{16}$

2 Attacking the Problem

2.1 Example One

Given that our base address is (in hexadecimal) FFFAFDF, and that we have a two dimensional array declared as such:

double x = new *double*[8][10]

Find the element address of *double*[5][5].

The work

offset = 5*8 + 5(8*5)

offset = 40 + 200

offset = 240

offset = 240 = $15 \times 16^1 + 0 \times 16^0$

offset = 240 = $F0_{16}$

element address = $FFFAFDF_{16}$ + 240

element address = $FFFAFDF_{16}$ + $F0_{16}$

element address = $FFFB0CF_{16}$

2.2 Example Two

Given that our base address is (in hexadecimal) FFFAFDF, and that we have a two dimensional array declared as such:

double x = new *double*[8][10]

Find the element address of *double*[6][8].

The work

offset = 8*8 + 6(8*6)

offset = 64 + 288

offset = 352

offset = $352 = 1 \times 16^2 + 6 \times 16^1 + 0 \times 16^0$

offset = 160_{16}

element address = $\text{FFFAFDF}_{16} + 352$

element address = $\text{FFFAFDF}_{16} + 160_{16}$

element address = FFFB13F_{16}