CS3035 Programming Paradigms

Lab 02-2: Data Types

Solution

Total Points: 10

Q1: [4 POINTS]

Multidimensional arrays can be stored in row major order, as in C++, or in column major order, as in Fortran. Develop the **access functions** for both of these arrangements for three-dimensional arrays.

Answer:

Let the subscript ranges of the three dimensions be named `min(1)`, `min(2)`, `min(3)`, `max(1)`, `max(2)`, and `max(3)`. Let the sizes of the subscript ranges be `size(1)`, `size(2)`, and `size(3)`. Assume the element size is 1.

Row Major Order:

location(`a[i,j,k]`) = (address of `a[min(1),min(2),min(3)]`)

`+((i-min(1))*size(3) + (j-min(2)))*size(2) + (k-min(3))`

Column Major Order:

location(`a[i,j,k]`) = (address of `a[min(1),min(2),min(3)]`)

`+((k-min(3))*size(1) + (j-min(2)))*size(2) + (i-min(1))`

Q2: [3 POINTS]

In what way is static type checking better than dynamic type checking?

Answer:

Static type checking is better than dynamic type checking for two reasons: First, anything done at compile time leads to better overall efficiency, simply because production programs are often executed but far less often compiled. Second, type checking uncovers program errors, and the earlier errors are found the less costly it is to remove them.

Q3: [3 POINTS]

Explain how coercion rules can weaken the beneficial effect of strong typing.

Answer:

A language that allows many type coercions can weaken the beneficial effect of strong typing by allowing many potential type errors to be masked by simply coercing the type of an operand from its incorrect type given in the statement to an acceptable type, rather than reporting it as an error.