
Subject: Re: Vectorization question

Posted by [Liam E. Gumley](#) on Thu, 14 Sep 2000 07:00:00 GMT

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"Liam E. Gumley" wrote:

> Given the following arrays

>

> a = intarr(10)

> x = [2, 2, 2, 3, 3, 4]

> b = [1, 3, 4, 2, 1, 8]

>

> How would I vectorize the following operation

>

> for i = 0, n_elements(x) - 1 do a[x[i]] = a[x[i]] + b[i]

>

> To achieve this result

>

> print, a, format='(10i4)'

> 0 0 8 3 8 0 0 0 0 0

>

> In the real-world case where this occurs, I need to repeat this kind of

> operation several hundred times, where the size of 'a' is around

> 1,000,000 and the size of 'x' is around 100,000 ('a' and 'b' are float

> type in the real-world case).

It dawned on me that this is a perfect case for an external routine.

Following the example in the 'External Development Guide' for calling a FORTRAN routine with a FORTRAN wrapper, I created the following source file named vecadd.f

C-----

c ... This is the interface routine called by IDL

subroutine vecadd(argc, argv)

integer*4 argc, argv(*), j

j = loc(argc)

call vecadd1(%val(argv(1)), %val(argv(2)), %val(argv(3)),

& %val(argv(4)), %val(argv(5)))

end

c ... This is the routine which does the work.

c ... The arguments are defined exactly the same as in the

c ... call_external procedure call in IDL.

subroutine vecadd1(a, na, x, nx, b)

integer*4 na, nx

real*4 a(na), b(nx)

integer*4 x(nx), i

do i = 1, nx

a(x(i)) = a(x(i)) + b(i)

```
    end do
  end
C-----
```

I run IDL 5.3 on SGI IRIX 6.4, so the compile went as follows:

```
% f77 -n32 -KPIC -u -fullwarn -c vecadd.f
% ld -n32 -o vecadd.so vecadd.o
```

The IDL wrapper for this routine is named vecadd.pro:

```
;-----
FUNCTION VECADD, ARRAY, INDEX, VALUE

;- Check arguments
if (n_elements(array) eq 0) then $
  message, 'Argument A is undefined'
if (n_elements(index) eq 0) then $
  message, 'Argument X is undefined'
if (n_elements(value) eq 0) then $
  message, 'Argument B is undefined'
if (n_elements(index) ne n_elements(value)) then $
  message, 'Arguments X abd B must have the same number of elements'

;- Create copies of the arguments with correct type
a = float(array)
x = (long(index) > 0L) < (n_elements(a) - 1L)
b = float(value)

;- Call the external routine
result = call_external('vecadd.so', 'vecadd_', $
  a, n_elements(a), x, n_elements(x), b)

;- Return result
return, a

END
;-----
```

So the operation I described is now quite simple:

```
a = fltarr(10)
x = [2, 2, 2, 3, 3, 4]
b = [1, 3, 4, 2, 1, 8]
result = vecadd(a, x, b)
help, result
RESULT      FLOAT    = Array[10]
print, result, format='(10i4)'
```

0 8 3 8 0 0 0 0 0 0

The result is always returned as FLOAT, which is what I really wanted anyway. For the large arrays I described, VECADD is at least 10 times faster than a loop.

Thanks IDL!

Cheers,

Liam.

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PS: Pavel, thanks for your suggestion as well.
