Subject: Re: Efficiently multiplying an array by a vector
Posted by wlandsman on Wed, 28 Sep 2016 02:51:45 GMT
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Three things:

1. Have you actually found the speed to be problematic? In general, looping over a single loop index is not a large speed penalty, and what you want to avoid is looping over 2 or more indices. The IDL maxim for efficient programming is not "avoid loops" but "try to get a much done as possible during each loop iteration". If your matrices have a million elements then you are already following this maxim.

2. The process can likely be sped up by avoiding the use of the asterisk on the left hand side. http://www.idlcoyote.com/code_tips/asterisk.html

In your case, this would require a transpose

```
 c = transpose(c)
FOR i=0,ncol-1 DO c[0,i] = a[i,*] * b
c = transpose(c)
```

though the first transpose can likely be incorporated into the creation of the c matrix.

3. I believe that Python does have the capability to efficiently multiply every column in a 2D array by a vector using "broadcasting"

http://eli.thegreenplace.net/2015/broadcasting-arrays-in-num py/

I don't believe that this capability is available in IDL but it would be a nice feature for Harris Geospatial to add.

--Wayne

On Tuesday, September 27, 2016 at 9:38:15 PM UTC-4, LH wrote:
> The following text is a slightly edited version of a post by Mark Plonski several years ago that was never answered. Just saving typing time because my problem is the same. In fact, it seems like it must be a common problem when one tries to vectorize and speed up a program.
>
>
> What is the most efficient way to multiply every col in a 2D array
> (ncol x nrow) by a vector of length (ncol)?
>
> Example:
>
> input array vector output array

>
> a11 a12 a13   b1   a11b1 a12b1 a13b1
> a21 a22 a23   b2   a21b2 a22b2 a23b2
>
>
> This could be done by looping over the cols:
>
>   FOR i=0,ncol-1 DO c[i,*] = a[i,*] * b
>
> Is there a more efficient way (w.r.t. computational speed) to do this?
>
> I know I could replicate the column vector into a matrix (b # identity row)
> and then do a ptwise matrix multiply, but my matrices can
> be very large (1M elements) and I occasionally run out of swap
> space. I don't know if that would run any faster anyway.
