Subject: Re: For-loop vs. Dimensional Juggling relative performance
Posted by rogass on Tue, 09 Feb 2010 15:52:38 GMT
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On 9 Feb., 05:26, Gray <grayliketheco...@gmail.com> wrote:
> Hi folks,
>
> I recently wrote my own version of SRCOR from the NASA Astrolib. Just
> as a reminder, the program takes two lists of 2D coordinates and finds
> matches where the distance is less than some cutoff. SRCOR uses a for-
> loop to step through the first list, comparing the distance of each
> coordinate-pair from every point in the second list. My version uses
> matrix multiplication and dimensional juggling to avoid the for-loop.
>
> For n1 = 2143 and n2 = 2115, SRCOR is faster (0.16 seconds to my 0.53
> on my macbook); however, for n1 = 25 and n2 = 26, mine is faster
> (1.8e-4 seconds to 4.2e-4). Is there any way to predict what kind of
> list sizes will be faster with each method, without making some random
> data and using brute force?
>
> The relevant code is:
>
> SRCOR (dcr2 is the cutoff, option eq 2 ignores the cutoff) -->
>
> FOR i=0L,n1-1 DO BEGIN
> xx = x1[i] & yy = y1[i]
> d2=(xx-x2)^2+(yy-y2)^2
> dmch=min(d2,m)
> IF (option eq 2) or (dmch le dcr2) THEN BEGIN
> ind1[nmch] = i
> ind2[nmch] = m
> nmch = nmch+1
> ENDIF
> ENDFOR
>
> My code -->
>
> lkupx = rebin(indgen(n1),n1,n2) ;make index lookup
> tables, so as not to
> lkupy = rebin(transpose(indgen(n2)),n1,n2) ;worry about confusing
> 1D vs 2D
> ;use matrix multiplication and dim. juggling to fast compute
> sqrt((x2-x1)^2+(y2-y1)^2)
> dists =
> sqrt(rebin(x1^2.+y1^2,n1,n2)+rebin(transpose(x2^2.+y2^2),n1, n2)-2*(x1#x2+y1 #y2))
> min_x = min(dists,xmatch,dimension=2) ;find the minima in both
> directions...
> min_y = min(dists,ymatch,dimension=1) ;this is given in 1D indices

>    xm = lkupy[xmatch]  ;convert to 2D indices
>    ym = lkupx[ymatch]
>    ;remove elements w/ distance greater than max_dist, and where the
> two lists don't match
>    nomatch_x = where(ym[xm] ne indgen(n1) or min_x gt max_dist, nmx)
>    if (nmx gt 0) then xm[nomatch_x] = -1
>    nomatch_y = where(xm[ym] ne indgen(n2) or min_y gt max_dist, nmy)
>    if (nmy gt 0) then ym[nomatch_y] = -1
>
> Thanks!!
> --Gray (first time poster)

Hi Gray,
there is some potential to optimise your code:
a) use the SAMPLE keyword within rebin
b) generate one big index and use it again like:
 bigind = lindgen(n1>n2,n1>n2) mod (n1>n2)
 lkupx=bigind[0:n1-1,0:n2-1]
 lkupy=transpose(bigind[0:n2-1,0:n1-1])
nomatch_x = where(ym[xm] ne bigind[0:n1-1] or min_x gt max_dist, nmx)
nomatch_y = where(xm[ym] ne bigind[0:n2-1] or min_y gt max_dist, nmy)
c) just compute x1^2 by using x1*x1 etc. ->its faster because exp
won't be internally used

Nevertheless, your approach might be ever faster for small matrices
because it hasn't any loop overhead, which may not relevant for large
matrices.

Cheers

CR