Subject: For-loop vs. Dimensional Juggling relative performance
Posted by Gray on Tue, 09 Feb 2010 04:26:08 GMT
View Forum Message <> Reply to Message

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)