
Subject: fast convolving question

Posted by [rogass](#) on Wed, 28 May 2008 15:16:09 GMT

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Dear all,

the following code is able to convolve 2 matrices (e.g. 100x100 with 100x100) very fast by using 3 different approaches.

The first one is fft. The second one is based on pre-computing indices (only ~6 times slower than fft by the given size) and multiplying indexed vectors with 1 for-loop and the third one is without any loop (~100 times faster than fft by the given size).

My aim i.e the task is to convolve always without the use of fft, so i made this script. Unfortunately something is going wrong with the third method and I can't find where the error is.

Please, help me!

Thanks and king regards

Christian

Here it is:

Function convolve, a,b,method,loop=loop

if method eq 'fft' then begin

```
s1=size(a)
s2=size(b)
nx1=s1[1]
ny1=s1[2]
nx2=s2[1]
ny2=s2[2]
aa=fltarr(nx1+nx2-1,ny1+ny2-1)
bb=fltarr(nx1+nx2-1,ny1+ny2-1)
aa[0,0]=a
bb[nx1-1,ny1-1]=b
conv=double(shift(fft(fft(aa,-1)*fft(bb,-1),
1)*n_elements(aa),nx2,ny2))
return, conv
endif
```

if method eq 'discrete' then begin

kernel = a

```

matrix = b

siz_k = size(kernel,/dimensions)
sx_k = siz_k[0]
sy_k = siz_k[1]
sk = sx_k*sy_k

siz_m = size(matrix,/dimensions)
sx_m = siz_m[0]
sy_m = siz_m[1]
sm = sx_m*sy_m

conv = fltarr(sm,/nozero)
mat = fltarr(sx_k+sx_m-1,sy_k+sy_m-1)
;padding matrix with zeros
mat[((sx_k-1)/2):((sx_k-1)/2+sx_m-1),((sy_k-1)/2):((sy_k-1)/2+sy_m-1)]
= matrix
;compute indices
indarray2 = make_array(sx_m+sx_k-1,sy_m+sy_k-1,/index)
indarray = transpose(indarray2)
ind = reform(indarray[0:sx_m-1,0:sy_m-1],sm,/overwrite)
indsmall = (indarray[0:sx_k-1,0:sy_k-1])(reverse(indarray2[0:sk-1]))
kernel = reform(kernel,sk,1,/overwrite)

;convolve by multiplying vectors
if keyword_set(loop) then $
  for i=0,sm-1 do (conv)[i]=kernel##mat( indsmall+ind(i) ) $

else (conv)[(i=indarray2[0:sm-1])]=kernel##mat( indsmall+ind(i) )

conv = reform(conv,sx_m,sy_m,/overwrite)
return, conv
endif
end

pro test_method_conv

par = 100
a = dist(par)
b = dist(par)

t0=systime(1)
c1=convolve(a,b,'fft')
print,'Convolve with fft: ',systime(1)-t0,' seconds'
Window,1,xsize=200,ysize=200,title='Convolve with fft' &
TVSCL,congrid(c1,100,100)

```

```
t0=systime(1)
c2=convolve(a,b,'discrete')
print,'Convolve discrete without loop: ',systime(1)-t0,' seconds'
Window,2,xsize=200,ysize=200,title='Convolve discrete without loop' &
TVSCL,congrid(c2,100,100)
```

```
t0=systime(1)
c3=convolve(a,b,'discrete',/loop)
print,'Convolve discrete with loop: ',systime(1)-t0,' seconds'
Window,3,xsize=200,ysize=200,title='Convolve discrete with loop' &
TVSCL,congrid(c3,100,100)
end
```
