Subject: Re: Convol with Kernel Dependency Of the Radius to the Middle
Posted by Martin Downing on Wed, 31 Oct 2001 15:09:47 GMT
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Hi Kay,

I was wondering about a radial-proportioned linear combination of two gaussian smoothings, one for the edge and one for the middle - however the intermediate values are not a good approximation :(
I'm afraid I think you will have to code it from scratch, probably with 6 for loops(!).Convolutions are easy, just for loops. - I think I'd go straight to coding it as a callable C routine, as then you wont have to worry about the many loops, I would also not bother computing a kernel as it will change too often, instead create a lookup table for your gaussian's exponents.
e.g. : gauss_exp(sig = s, x = x) = GAUSS_LUT_100[100*(x*x)/(2*s*s)]

a simple IDL-convolve algorithm is given below, youll have to modify it to include the radial bit
good luck,
Martin

```
function eg_convol3d, array, kern, debug=debug
; a simple convolution routine

if keyword_set(debug) then t0 = systime(1)
b = array*0.
sa = size(array)
sk = size(kern)

; note: ignoring edges
for k = sk(3)-1, sa(3)-1 do begin
 for j = sk(2)-1, sa(2)-1 do begin
  for i = sk(1)-1, sa(1)-1 do begin

   v = 0
   for n = 0, sk(3)-1 do begin
    for m = 0, sk(2)-1 do begin
     for l = 0, sk(1)-1 do begin
       v = v + array[i-l, j-m, k-n]*kern[l, m, n]
     endfor
    endfor
   endfor

   b[i-sk(1)/2,j-sk(2)/2,k-sk(3)/2] = v

  endfor
 endfor
```

```
endfor

if keyword_set(debug) then print, "convol completed in ", systime(1) -  t0,
" sec
return, b

end
```

"Kay" <bente@uni-wuppertal.de> wrote in message
news:e143e8bc.0110310114.3cbb5c53@posting.google.com...
> Hi,
>> I assume you mean that the function that describes the 3d kernel depends
on
>> the radial (cartesian) distance of the image voxel from a point in the
>> image:
>> *pseudo formula alert!*
>> Image'(x,y,z) = Image [convolved_with] Kernel(R(x,y,z))
>> where R(x,y,z) = sqrt((X-Xo)^2+(Y-Yo)^2 + (Z-Zo)^2))
>
> Thats right.
>
>> If so, I guess the question is, what is the dependency of the kernel on
R?
>> If linear then maybe the radial aspect of the kernel is separable
>
> My Proffessor had the "nice" idea, that a PET image, has a better
> resolution in the middle of the picture than on the edge for each
> slice. To simulate this he wants that the Kernel has a dependency of x
> & y (not z!) in that form that the FWHM (Full Width Half Max) of a 3D
> Gaussian Kernel increases linear with the distance from the middle.
>
> Thats a bit too much for my "weak" knowledge of IDL, I solved it in
> that form, that i convol the whole stuff 10 times and then copy

> not as smooth as it should be.
>
> I think I have to write a complete new convol function :-((
> smile
>
> thanks for the answer.
>
> Kay