Subject: Re: The Behavior of CONVOL Posted by agraps on Fri, 01 Nov 1996 08:00:00 GMT

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"Kevin R. Turpie" <turpie@seaeagle.gsfc.nasa.gov> writes:

- > I've found the behavior of CONVOL to be a bit confusing. Please
- > let me know if I'm missing something, but here are my observations:

I've noticed confusing behavior too.

[...]

- > Second, when CENTER is set to 0, CONVOL does a convolution in a
- > strict sense *if* the input kernel function, say k(x), is defined
- > so that k(x) = 0 for all x < 0. The result is usually shifted to
- > the right.

So that's what's going on... I've noticed the right shift. I've had to "fix" (fudge?) the first values to get the result that I knew I should have gotten.

- > To do a true convolution with CONVOL for any kernel, it seems that
- > CENTER must be set to 1 and REVERSE must be applied to each dimension
- > of the kernel prior to input.

This is really useful, thanks.

I wrote a function a couple of years ago that performed the equivalent of Matlab's "conv" (convolution) function. (It's crude, but it works.) That's when I first noticed the different behavior. I'll attach it below.

- > PS If your interested, I did create a routine to perform
- > two dimensional convolutions using a FFT. It is *very* fast
- > and behaves like CONVOL with the EDGE WRAP keyword on and
- > the kernel oriented properly.

I'm interested.

Amara

FUNCTION conv, a, b

;+

; NAME:

CONV

```
: PURPOSE:
    This function performs a convolution operation like Matlab's conv.
    CATEGORY:
    Signal Processing
    CALLING SEQUENCE:
           y = CONV(a, b)
: INPUTS:
           a: 1st vector.
           b: 2nd vector, the "kernel"
    OUTPUTS:
           y: a convolved with b. See description in Matlab Reference Manual
                                    for conv.
    MODIFICATION HISTORY:
    Written by Amara Graps November, 1994.
;Pad a with zeros of size of the kernel
p = N ELEMENTS(b)
new_a = [a,FLTARR(p-1)]
;Apply IDL's convolution function
out = CONVOL(new a, b, center = 0)
;Calculate results for 1st p-1 values (another Fudge to equal
;Matlab's conv). i.e. if p=5 then the first p values are:
out(0) = new a(0)*b(0)
\operatorname{jout}(1) = \operatorname{new}_a(0)*b(1) + \operatorname{new}_a(1)*b(0)
\operatorname{jout}(2) = \operatorname{new}_a(0)^*b(2) + \operatorname{new}_a(1)^*b(1) + \operatorname{new}_a(2)^*b(0)
\cot(3) = \text{new}_a(0)*b(3) + \text{new}_a(1)*b(2) + \text{new}_a(2)*b(1) + \text{new}_a(3)*b(0)
\cot(4) = \text{new } a(0)*b(4) + \text{new } a(1)*b(3) + \text{new } a(2)*b(2) + \text{new } a(3)*b(1) + \cot(4) = \cot(4) + \cot(4)
                         new_a(4)*b(0)
FOR i = 0, p-1 DO BEGIN
 out(i) = new_a(0) * b(i)
  FOR I = 1, i DO BEGIN
   out(i) = out(i) + new_a(l)*b(i-l)
  END:
END;i
RETURN, OUT
END ;function conv
```

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