Subject: rebin and half pixel offset Posted by Robert Barnett on Fri, 28 May 2004 00:10:47 GMT View Forum Message <> Reply to Message

I wondered if anyone can verify if I understand the behaviour of rebin correctly. Thanks in advance for looking at this problem.

I'm currently putting together a ROI drawing program which allows the user to draw regions on a zoomed image. Sometimes it is preferrable to see a bilinear interpolated image whilst at other times it is preferrable to see a nearest neighbour image.

After using rebin I noticed that there was a difference between the two methods. Because of the way rebin works, the bilinear method offsets the image and hence causes my ROI's (drawn using plots) to appear offset.

The offset is 0.5 pixels if you do the shifting before rebin or it may be zoom/2 pixels if the shifting is done after rebin

I've put together a little test program to demonstrate this. The input array is [0,1 ... m-2,m-1] This array is rebined to a larger array of size (m * zoom) The results of using neareast neighbour and bilinear interpolation are printed. The difference is also printed

```
pro testRebinOffset, m, zoom
m = floor(m > 1.0)
zoom = floor(zoom > 1.0)
n = zoom * m; The size of the output array
input = float(indgen(m)); The input array
   ; use float so that rebin an do
                                     ; floating point arithmetic
; Rebin using bilinear interpolation and then apply the shift
bi = round(shift(rebin(input,n),zoom/2))
; Fix up the 'wrapping' caused by the shift function
bi[0:zoom/2] = input[0]
print, "Bilinear Interpolation", bi
: Rebin using nearest neighbour method
nn = round(rebin(input,n,/sample))
print, "Nearest Neighbour", nn
print, "Difference", nn - bi
end
; An example usage
IDL> testrebinoffset,3,4
Bilinear Interpolation
                            0
                                    0
                                             0
                                                     0
```

1

1

1

2

2

2	2				
Nearest Neighbour		0	0	0	0
1					
1	1	1	2	2	2
2					
Difference	0	0	0	0	0
0	0	0	0	0	0
0					

This test fails when the input array is anything more complicated than an indgen array, however, I am fairly certain that this is the best approximation for making coordinates in both spaces equivalent

Regards, Robbie

Westmead Hospital, Sydney Australia

Subject: Re: rebin and half pixel offset
Posted by peter.julyan on Mon, 07 Jun 2004 08:36:05 GMT
View Forum Message <> Reply to Message

Robert Barnett <retsil@zipworld.com.au> wrote in message news:<40B68387.6020207@zipworld.com.au>...

- > I wondered if anyone can verify if I understand the behaviour of rebin
- > correctly. Thanks in advance for looking at this problem.

>

- > I'm currently putting together a ROI drawing program which allows the
- > user to draw regions on a zoomed image. Sometimes it is preferrable to
- > see a bilinear interpolated image whilst at other times it is
- > preferrable to see a nearest neighbour image.
- > After using rebin I noticed that there was a difference between the two
- > methods. Because of the way rebin works, the bilinear method offsets the
- > image and hence causes my ROI's (drawn using plots) to appear offset.

>

- > The offset is 0.5 pixels if you do the shifting before rebin or it may
- > be zoom/2 pixels if the shifting is done after rebin

>

- > I've put together a little test program to demonstrate this.
- > The input array is [0,1 ... m-2,m-1]
- > This array is rebined to a larger array of size (m * zoom)
- > The results of using neareast neighbour and bilinear interpolation are
- > printed. The difference is also printed

>

- > pro testRebinOffset, m, zoom
- > m = floor(m > 1.0)

```
zoom = floor(zoom > 1.0)
   n = zoom * m; The size of the output array
>
   input = float(indgen(m)); The input array
     ; use float so that rebin an do
                                       ; floating point arithmetic
>
>
  ; Rebin using bilinear interpolation and then apply the shift
   bi = round(shift(rebin(input,n),zoom/2))
  ; Fix up the 'wrapping' caused by the shift function
> bi[0:zoom/2] = input[0]
  print, "Bilinear Interpolation", bi
>
  ; Rebin using nearest neighbour method
  nn = round(rebin(input,n,/sample))
   print, "Nearest Neighbour", nn
>
>
   print, "Difference", nn - bi
>
  end
  ; An example usage
>
  IDL> testrebinoffset,3,4
  Bilinear Interpolation
                              0
                                      0
>
                                                       0
                           1
                                    1
                                            2
                                                    2
          1
                   1
>
          2
                   2
>
  Nearest Neighbour
                            0
                                     0
                                             0
                                                      0
>
     1
          1
                                                    2
                   1
                                   2
                                            2
                           1
>
          2
>
  Difference
                   0
                            0
                                    0
                                             0
                                                     0
                           0
                                   0
          0
                   0
                                            0
                                                    0
>
          0
>
 This test fails when the input array is anything more complicated than
  an indgen array, however, I am fairly certain that this is the best
  approximation for making coordinates in both spaces equivalent
>
 Regards, Robbie
>
> Westmead Hospital,
> Sydney
```

Robert,

> Australia

This seems pretty much to make sense, this is spelt out explicitly in the manual for CONGRID where, since 5.5, there is the /CENTER option to "shift the interpolation so that points in the input and output arrays are assumed to lie at the midpoint of their coordinates rather than at their lower-left corner." I came across this a while back

doing some ROI stuff and use CONGRID in this instance.

Hope this helps, Pete.

Peter Julyan, Ph.D - PET Physicist North Western Medical Physics Christie Hospital NHS Trust Withington, Manchester, M20 4BX

Tel: 0161 446 3078 Fax: 0161 446 3543 e-mail: p.julyan"funny symbol"physics.org

http://www.ManPET.man.ac.uk