## Subject: Re: Does IDL has histogram matching function? Posted by David Fanning on Fri, 08 Nov 2002 08:24:04 GMT

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TIAN Yunfeng (tianyf\_cn@yahoo.com.cn) writes:

- > I want to do a histogram matching work between two images with several bands.
- > But IDL does not provide such functions or procudures.
- > How can I achieve this?

Oddly enough, I was just thinking about histogram matching because I was re-reading that section of the book in Digital Image Processing by Gonzales and Woods. (Have I mentioned what a great book this is!?) I think I finally understand how to do this.

I was thinking of an application that allowed you to draw the histogram you were trying to match, but it would be even more straightforward if you already had the histogram from another image.

I expect it might take a day or so to write the code. Do you have any money? :-)

Cheers.

David

--

David W. Fanning, Ph.D.

Fanning Software Consulting, Inc.

Phone: 970-221-0438, E-mail: david@dfanning.com

Coyote's Guide to IDL Programming: http://www.dfanning.com/

Toll-Free IDL Book Orders: 1-888-461-0155

Subject: Re: Does IDL has histogram matching function? Posted by David Fanning on Fri, 08 Nov 2002 17:35:46 GMT View Forum Message <> Reply to Message

David Fanning (david@dfanning.com) writes:

- > I expect it might take a day or so to write the code.
- > Do you have any money? :-)

Ah, forget the money. This turned out to be too easy. :-)

Here is a routine, named HISTOMATCH, that takes an image and a histogram that you would like to perform histogram

```
matching to.
.****************
FUNCTION HistoMatch, image, histogram_to_match
; Perform histogram matching according to the method of
; Gonzales and Woods in Digital Image Processing, pp 94-102
; image - The input image.
; histogram to match - The histogram used for histogram matching.
 ; Calculate the histogram of the input image.
h = Histogram(Byte(image), Binsize=1, Min=0, Max=255)
totalPixels = Float(N_Elements(image))
 ; Find a mapping from the input pixels to s.
s = FltArr(256)
FOR k=0,255 DO BEGIN
 s[k] = Total(h(0:k) / totalPixels)
ENDFOR
 ; Find a mapping from input histogram to v.
v = FltArr(256)
FOR q=0,255 DO BEGIN
 v[q] = Total(histogram_to_match(0:q) / totalPixels)
ENDFOR
 ; Find z from v and s.
z = BytArr(256)
FOR j=0,255 DO BEGIN
 I = Where(v LT s[j], count)
 IF count GT 0 THEN z[i] = (Reverse(I))[0] ELSE z[i]=0
ENDFOR
 ; Create the matched image.
matchedImage = z[Byte(image)]
RETURN, matchedImage
END
.*****************
I'm certain JD or someone will point out to me how to
use another Histogram to eliminate the Where function,
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but, hey, this is for free. I'm trying to make a living

```
Does it work!? I think so. I'm not sure.
Try this. Let's see if we can match am image to the
histogram formed by calculating the histogram of
the histogram equalized image. (The result should
be the same as the histogram equalized image, more
or less.)
.******************
PRO TestIt
filename = Filepath('ctscan.dat', Subdir=['examples', 'data'])
OpenR, lun, filename, /Get_Lun
image = BytArr(256, 256)
ReadU, lun, image
Free Lun, lun
Window, XSize=3*256, YSize=256
TV, image, 0
TV, Hist_Equal(image), 1
TV, HistoMatch(image, Histogram(Hist Equal(image), Min=0, Max=255)), 2
END
 *****************
 IDL> TestIt
Wow! And this was on the *first* try. *That* doesn't happen too
often.:-)
Try this:
 a = LonGen(255)
 b = a \# b
 b = BytScl(b)
 Window, 1
 Plot, Histogram(b, Min=0, Max=255)
 Window, 2, XSize=256, YSize=256)
 TV, HistoMatch(image, Histogram(b, Min=0, Max=255))
Still looks good, I think.
OK, I'm waiting for feedback. :-)
Cheers.
David
```

here.:-(

--

David W. Fanning, Ph.D.

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Phone: 970-221-0438, E-mail: david@dfanning.com

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Subject: Re: Does IDL has histogram matching function? Posted by David Fanning on Fri, 08 Nov 2002 17:48:46 GMT

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David Fanning (david@dfanning.com) writes:

```
> Try this:
    a = LonGen(255)
    b = a \# b
>
    b = BytScl(b)
>
    Window, 1
    Plot, Histogram(b, Min=0, Max=255)
>
    Window, 2, XSize=256, YSize=256)
    TV, HistoMatch(image, Histogram(b, Min=0, Max=255))
> Still looks good, I think.
> OK, I'm waiting for feedback. :-)
OK, the first feedback is from a disgruntled user
who takes my typing literally (if you can imagine!)
Should be:
 b = a#a
Cheers,
David
David W. Fanning, Ph.D.
Fanning Software Consulting, Inc.
Phone: 970-221-0438, E-mail: david@dfanning.com
Coyote's Guide to IDL Programming: http://www.dfanning.com/
```

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Subject: Re: Does IDL has histogram matching function? Posted by Pavel A. Romashkin on Fri, 08 Nov 2002 23:41:15 GMT

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```
David Fanning wrote:
```

>

- > OK, the first feedback is from a disgruntled user
- > who takes my typing literally (if you can imagine!)

Uh, no wonder the autoreply on your vacation e-mail message is "And if you don't like it you're damn welcome to write it all by yourself!" :-) Cheers,
Pavel

Subject: Re: Does IDL has histogram matching function? Posted by aardvark62 on Mon, 18 Nov 2002 23:09:28 GMT View Forum Message <> Reply to Message

There is an undocumented keyword to HIST\_EQUAL that looks like it might do the same thing as Davids HistoMatch. Here is an example:

filename = filepath('ctscan.dat', subdir=['examples', 'data']) image = read\_binary(filename, data\_dims=[256, 256])

desired\_hist = histogram(hist\_equal(image), min=0, max=255)

window, xsize=3\*256, ysize=256
tv, image, 0
tv, hist\_equal(image), 1
tv, hist\_equal(image, fcn=total(desired\_hist, /cumulative)), 2
end

David Fanning <david@dfanning.com> wrote in message news:<MPG.1835a3e2693e7288989a0b@news.frii.com>...

- > David Fanning (david@dfanning.com) writes:
- >

>

>

- >> I expect it might take a day or so to write the code.
- >> Do you have any money? :-)
- > Ah, forget the money. This turned out to be too easy. :-)
- > Here is a routine, named HISTOMATCH, that takes an image
- and a histogram that you would like to perform histogrammatching to.
- > FUNCTION HistoMatch, image, histogram\_to\_match

```
>
> ; Perform histogram matching according to the method of
> ; Gonzales and Woods in Digital Image Processing, pp 94-102
  ; image - The input image.
  ; histogram_to_match - The histogram used for histogram matching.
>
    ; Calculate the histogram of the input image.
>
> h = Histogram(Byte(image), Binsize=1, Min=0, Max=255)
  totalPixels = Float(N_Elements(image))
    ; Find a mapping from the input pixels to s.
>
>
> s = FltArr(256)
> FOR k=0,255 DO BEGIN
   s[k] = Total(h(0:k) / totalPixels)
  ENDFOR
    ; Find a mapping from input histogram to v.
> v = FltArr(256)
> FOR q=0,255 DO BEGIN
   v[q] = Total(histogram_to_match(0:q) / totalPixels)
> ENDFOR
>
    ; Find z from v and s.
>
> z = BytArr(256)
> FOR j=0,255 DO BEGIN
   I = Where(v LT s[i], count)
    IF count GT 0 THEN z[j] = (Reverse(I))[0] ELSE z[j]=0
 ENDFOR
    ; Create the matched image.
>
> matchedImage = z[Byte(image)]
> RETURN, matchedImage
> END
> I'm certain JD or someone will point out to me how to
> use another Histogram to eliminate the Where function,
> but, hey, this is for free. I'm trying to make a living
> here. :-(
> Does it work!? I think so. I'm not sure.
>
```

```
> Try this. Let's see if we can match am image to the
> histogram formed by calculating the histogram of
> the histogram equalized image. (The result should
> be the same as the histogram equalized image, more
> or less.)
> PRO TestIt
> filename = Filepath('ctscan.dat', Subdir=['examples', 'data'])
> OpenR, lun, filename, /Get Lun
> image = BytArr(256, 256)
> ReadU, lun, image
> Free_Lun, lun
> Window, XSize=3*256, YSize=256
> TV, image, 0
> TV, Hist_Equal(image), 1
> TV, HistoMatch(image, Histogram(Hist_Equal(image), Min=0, Max=255)), 2
> END
  .***************
   IDL> TestIt
>
> Wow! And this was on the *first* try. *That* doesn't happen too
 often.:-)
> Try this:
   a = LonGen(255)
>
   b = a#b
>
   b = BytScl(b)
   Window, 1
>
   Plot, Histogram(b, Min=0, Max=255)
>
   Window, 2, XSize=256, YSize=256)
   TV, HistoMatch(image, Histogram(b, Min=0, Max=255))
>
Still looks good, I think.
 OK, I'm waiting for feedback. :-)
> Cheers,
> David
```

Subject: Re: Does IDL has histogram matching function? Posted by tianyf\_cn on Sat, 23 Nov 2002 08:34:05 GMT

Maybe I want to process float type images. Or the output data values are in a narrow range. Does anyone have some ideas?

Thanks. Yours, Tian. David Fanning <david@dfanning.com> wrote in message news:<MPG.1835a3e2693e7288989a0b@news.frii.com>... > David Fanning (david@dfanning.com) writes: >> I expect it might take a day or so to write the code. >> Do you have any money? :-) Ah, forget the money. This turned out to be too easy. :-) > > Here is a routine, named HISTOMATCH, that takes an image and a histogram that you would like to perform histogram > matching to. .\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* > FUNCTION HistoMatch, image, histogram\_to\_match ; Perform histogram matching according to the method of ; Gonzales and Woods in Digital Image Processing, pp 94-102 ; image - The input image. > ; histogram\_to\_match - The histogram used for histogram matching. > ; Calculate the histogram of the input image. > h = Histogram(Byte(image), Binsize=1, Min=0, Max=255) totalPixels = Float(N Elements(image)) > ; Find a mapping from the input pixels to s. > > s = FltArr(256)> FOR k=0,255 DO BEGIN s[k] = Total(h(0:k) / totalPixels)> ENDFOR ; Find a mapping from input histogram to v. > > v = FltArr(256)> FOR q=0,255 DO BEGIN v[q] = Total(histogram\_to\_match(0:q) / totalPixels)

```
> ENDFOR
   ; Find z from v and s.
>
> z = BytArr(256)
> FOR j=0,255 DO BEGIN
   I = Where(v LT s[j], count)
   IF count GT 0 THEN z[j] = (Reverse(I))[0] ELSE z[j]=0
> ENDFOR
>
   ; Create the matched image.
>
> matchedImage = z[Byte(image)]
> RETURN, matchedImage
> END
 .***************
> I'm certain JD or someone will point out to me how to
> use another Histogram to eliminate the Where function,
> but, hey, this is for free. I'm trying to make a living
> here. :-(
>
 Does it work!? I think so. I'm not sure.
> Try this. Let's see if we can match am image to the
> histogram formed by calculating the histogram of
> the histogram equalized image. (The result should
> be the same as the histogram equalized image, more
> or less.)
  .******************
> PRO TestIt
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> OpenR, lun, filename, /Get_Lun
> image = BytArr(256, 256)
> ReadU, lun, image
> Free_Lun, lun
>
> Window, XSize=3*256, YSize=256
> TV, image, 0
> TV, Hist Equal(image), 1
> TV, HistoMatch(image, Histogram(Hist_Equal(image), Min=0, Max=255)), 2
IDL> TestIt
>
> Wow! And this was on the *first* try. *That* doesn't happen too
```

```
> often. :-)
>
 Try this:
>
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    b = BytScl(b)
    Window, 1
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    Plot, Histogram(b, Min=0, Max=255)
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    Window, 2, XSize=256, YSize=256)
>
    TV, HistoMatch(image, Histogram(b, Min=0, Max=255))
>
  Still looks good, I think.
>
>
  OK, I'm waiting for feedback. :-)
>
> Cheers,
> David
```

Subject: Re: Does IDL has histogram matching function? Posted by aardvark62 on Mon, 09 Dec 2002 22:12:47 GMT View Forum Message <> Reply to Message

tianyf\_cn@yahoo.com.cn (TIAN Yunfeng) wrote in message news:<42e9d2cb.0211230034.560a064e@posting.google.com>...

- > Maybe I want to process float type images. Or the output data values
- > are in a narrow range. Does anyone have some ideas?

> Thanks.

> Yours,

> Tian.

Tain,

Are you wanting to specify your desired curve algebraically? As is done with QSIMP for example? If not, I think you will have to group your data into bins as is done with HIST\_EQUAL, FCN. The algorithm that I posted Friday for the FCN keyword, or David's algorithm, might be a start. As they stand, these algorithms limit you to 256 bins and BYTSCLed results. But they probably could be translated to higher resolution by substituting your own algebra where they call BYTSCL, or simply scaling your result to fit OMIN and OMAX.

## -Paul Sorenson

> David Fanning <david@dfanning.com> wrote in message

```
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>> ; histogram_to_match - The histogram used for histogram matching.
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     ; Calculate the histogram of the input image.
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>> h = Histogram(Byte(image), Binsize=1, Min=0, Max=255)
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```

```
TV, HistoMatch(image, Histogram(b, Min=0, Max=255))
>>
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>> Still looks good, I think.
  OK, I'm waiting for feedback. :-)
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>> Cheers,
>>
>> David
```

Subject: Re: Does IDL has histogram matching function? Posted by Paul Sorenson on Thu, 12 Dec 2002 22:11:40 GMT View Forum Message <> Reply to Message

## David Fanning writes:

- > Oddly enough, I was just thinking about histogram matching
- > because I was re-reading that section of the book in
- > Digital Image Processing by Gonzales and Woods. (Have I
- > mentioned what a great book this is!?) I think I finally
- > understand how to do this.

There are some things in that Gonzalez and Woods book that really hurt my brain. On page 96, they say that G(z) = T(r). Get out of town! :-) How can this be? They don't \*look\* the same in the plots shown on page 98 (Figure 3.19). G(z) is the desired cumulative distribution and T(r) is the cumulative distribution of the input image. All of this appears in their discussion of Histogram Matching.

## -Paul Sorenson

"Paul Sorenson" <aardvark62@msn.com> wrote in message news:8270ac8d.0212091412.51094acd@posting.google.com... > tianyf cn@yahoo.com.cn (TIAN Yunfeng) wrote in message news:<42e9d2cb.0211230034.560a064e@posting.google.com>... >> Maybe I want to process float type images. Or the output data values >> are in a narrow range. Does anyone have some ideas? >> >> Thanks. >> >> Yours, >> Tian. >> > Tain, > Are you wanting to specify your desired curve algebraically? As is

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```
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>>> ReadU, lun, image
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>>> TV, Hist Equal(image), 1
>>> TV, HistoMatch(image, Histogram(Hist Equal(image), Min=0, Max=255)), 2
>>> END
>>> :****
>>>
      IDL> TestIt
>>>
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>>> Wow! And this was on the *first* try. *That* doesn't happen too
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```
>>>
>>> Try this:
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      a = LonGen(255)
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>>>
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>>>
      Window, 2, XSize=256, YSize=256)
>>>
      TV, HistoMatch(image, Histogram(b, Min=0, Max=255))
>>>
>>>
>>> Still looks good, I think.
>>>
>>> OK, I'm waiting for feedback. :-)
>>>
>>> Cheers,
>>>
>>> David
-----= Posted via Newsfeed.Com - Uncensored Usenet News ==-----
 http://www.newsfeed.com
                             The #1 Newsgroup Service in the World!
----= Over 100,000 Newsgroups - Unlimited Fast Downloads - 19 Servers =----
```