Subject: Re: Question on plotting a histogram with original values
Posted by thompson on Thu, 06 Feb 1997 08:00:00 GMT
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David van Kuijk <kuijk@mpi.nl> writes:

> Hi

> I am using IDL3.0

> When I use the histogram-function I find it very annoying that I can't see
> which range of data has been put in which bin. Has anybody written a
> function which returns these values, or the mean values for each bin?

> To give an example:
> PRO testHisto

> testAr = [-44,0,-42,-58,-48,-25,-26,-1,-46,-36,-16,-55,-6,-81,10,-31, -38,$
>   -34,-49,-80,2,-40,-65,-3,10,-31,-85,-34,-27,-14,-41,-73,-67, 3,-51,$
>   -6,0,-107,-7,-36,-33,-59,-2,-99,-22]
> testHisto = histogram(testAr, BINSIZE = 10)
> plot, testHisto, PSYM = 10
> END

> This program will plot a nice histogram, but the values on the x-axis just
> show the rank number of the bins, and the information on the ranges of the
> original data is lost.

> I am sure the problem is solvable, but I don't want to spend too much time on
> this if somebody else already has found a solution.

You might try these routines. (I've commented out a reference to an old system
variable (!BCOLOR) that you won't have.)

Bill Thompson

```
 ============================================================
==================
 PRO PLOT_HISTO,ARRAY,STEPS,HISTO,TITLE=TITLE,XTITLE=XTITLE, $
  YTITLE=YTITLE,XTYPE=XTYPE,YTYPE=YTYPE,DELTA=DELTA, $
  BCOLOR=BCOLOR,XRANGE=XRANGE,YRANGE=YRANGE
;+
; Project     : SOHO - CDS
;
; Name        : PLOT_HISTO
;
; Purpose     : Plots a histogram from the variable ARRAY.
;
```

```
; Category    : Class3, Graphics
;
; Explanation : Plots a histogram from the variable ARRAY.  Calls FORM_HISTO to
;  decide what the coarseness of the histogram should be.  Then
;  PLOTBAR is called to plot the histogram.
;
; Syntax      : PLOT_HISTO, ARRAY  [, STEPS, HISTO ]
;
; Examples    :
;
; Inputs      : ARRAY = Array to plot histogram of.
;
; Opt. Inputs : None.
;
; Outputs     : None.
;
; Opt. Outputs: STEPS = Values at which histogram is taken.  Each value
;     represents histogram between STEP(I) and STEP(I+1).
;  HISTO = Histogram values.
;
; Keywords    : DELTA = Distance between histogram steps.  If not passed,
;     then FORM_HISTO chooses a suitable value.
;  TITLE = Main plot title, default is !P.TITLE.
;  XTITLE = X axis title, default is !X.TITLE.
;  YTITLE = Y axis title, default is !Y.TITLE.
;  XTYPE = If set, then X axis is logarithmic.
;  YTYPE = If set, then Y axis is logarithmic.
;  BCOLOR = Color to use instead of !BCOLOR for bar interiors.
;  XRANGE = Range of data values in the X direction.
;  YRANGE = Range of data values in the Y direction.
;
; Calls       : FORM_HISTO, PLOTBAR
;
; Common      : None.
;
; Restrictions: None.
;
; Side effects: None.
;
; Prev. Hist. :
; William Thompson Applied Research Corporation
; September, 1987  8201 Corporate Drive
;    Landover, MD  20785
;
; William Thompson, December 1991, added keywords XTYPE and YTYPE.
; William Thompson, May 1992, added keywords XRANGE and YRANGE.
;
; History     : Version 1, 22-Jan-1996, William Thompson, GSFC
```

```
;   Incorporated into CDS library
;
; Contact     : WTHOMPSON
;-
;
 ON_ERROR,2
;
;  Check the input parameters.
;
 IF N_PARAMS(0) EQ 0 THEN MESSAGE, $
  'Syntax:  PLOT_HISTO, ARRAY  [, STEPS, HISTO ]'
 IF N_ELEMENTS(ARRAY) LE 2 THEN MESSAGE, $
  ' Not enough points to form histogram.'
;
;  Check to see if a histogram is warranted.
;
 BANG_C = !C
 A_MAX = 1.*MAX(ARRAY)
 A_MIN = 1.*MIN(ARRAY)
 !C = BANG_C
 IF A_MAX EQ A_MIN THEN MESSAGE,  $
  'No histogram generated--all array elements equal to ' + $
   STRING(A_MAX)
 IF (A_MAX - A_MIN) LT (1E-4 * ABS(A_MIN)) THEN MESSAGE, $
  'No histogram generated--data range ' + STRING(A_MIN) + $
   ' to ' + STRING(A_MAX) + ' too narrow.'
;
;  Call FORM_HISTO to form the histogram, and PLOTBAR to plot it.
;
 FORM_HISTO,ARRAY,S,HISTO,DELTA=DELTA
 IF N_PARAMS(0) GT 2 THEN STEPS = S
  PLOTBAR,S,HISTO,TITLE=TITLE,XTITLE=XTITLE,YTITLE=YTITLE,XTYP E=XTYPE, $
  YTYPE=YTYPE,BCOLOR=BCOLOR,XRANGE=XRANGE,YRANGE=YRANGE
;
 RETURN
 END
 ============================================================
==================
 PRO FORM_HISTO,ARRAY,STEPS,HISTO,DELTA=DELTA
;+
; Project     : SOHO - CDS
;
; Name        : FORM_HISTO
;
; Purpose     : Forms a histogram from the variable ARRAY.
;
; Category    : Class4, Graphics
;
```

```
; Explanation : Forms a histogram from the variable ARRAY.  Decides what the
;  coarseness of the histogram should be.  Called from PLOT_HISTO.
;
;  ARRAY is scaled into a temporary variable to run from zero and
;  some reasonable number, depending on the number of elements of
;  ARRAY.  This number is the coarseness of the histogram,
;  i.e. the number of histogram bins.  The more elements in ARRAY,
;  the larger this number will be.  However, it will not exceed
;  100.  The HISTOGRAM function is then used on this temporary
;  variable.
;
;  If the optional parameter DELTA is passed, then FORM_HISTO uses
;  this value to determine the spacing of the histogram bins,
;  rather than calculating it's own bin spacing as described
;  above.
;
; Syntax      : FORM_HISTO, ARRAY, STEPS, HISTO
;
; Examples    :
;
; Inputs      : ARRAY = Array to form histogram from.
;
; Opt. Inputs : None.
;
; Outputs     : STEPS = Values at which histogram is taken.  Each value
;     represents histogram between STEP(I) and STEP(I+1).
;  HISTO = Histogram values.
;
; Opt. Outputs: None.
;
; Keywords    : DELTA = Distance between histogram steps.  If not passed,
;     then the routine chooses a suitable value.
;
; Calls       :
;
; Common      : None.
;
; Restrictions: None.
;
; Side effects: None.
;
; Prev. Hist. :
; William Thompson Applied Research Corporation
; September, 1987  8201 Corporate Drive
;    Landover, MD  20785
;
; William Thompson, May 1992, made DELTA a keyword parameter.
; William Thompson, 25 May 1993, changed to call HISTOGRAM with a long
```

```
;  array to make compatible with OpenVMS/ALPHA
;
; History     : Version 1, 22-Jan-1996, William Thompson, GSFC.
;   Incorporated into CDS library.
;
; Contact     : WTHOMPSON
;-
;
 ON_ERROR,2
;
;  Check the number of parameters.
;
 IF N_PARAMS(0) NE 3 THEN MESSAGE, $
  'Syntax:  FORM_HISTO, ARRAY, STEPS, HISTO'
;
;  Check the number of elements in ARRAY.
;
 IF N_ELEMENTS(ARRAY) LE 2 THEN MESSAGE,  $
  'Not enough points to form histogram'
;
;  Get the maximum and minimum values of ARRAY.
;
 BANG_C = !C
 A_MAX = 1.*MAX(ARRAY)
 A_MIN = 1.*MIN(ARRAY)
 !C = BANG_C
 IF A_MAX EQ A_MIN THEN BEGIN
    PRINT,'*** No histogram generated--all elements equal to ' +      $
       TRIM(A_MAX) + ', name= ARRAY, routine FORM_HISTO.'
    RETURN
 END ELSE IF (A_MAX - A_MIN) LT (1E-4 * ABS(A_MIN)) THEN BEGIN
    PRINT,'*** No histogram generated--range ' + TRIM(A_MIN) +       $
       ' to ' + TRIM(A_MAX) +           $
  ' too narrow, name= ARRAY, routine FORM_HISTO.'
    RETURN
 ENDIF
;
;  If passed, then check the value of DELTA.
;
 IF N_ELEMENTS(DELTA) NE 0 THEN BEGIN
    IF N_ELEMENTS(DELTA) NE 1 THEN BEGIN
  MESSAGE,'DELTA must be scalar'
    END ELSE IF DELTA LE 0 THEN BEGIN
       MESSAGE,'DELTA must be positive'
    ENDIF
;
;  If DELTA was not passed, then determine the approximate number of histogram
;  levels from the number of elements of ARRAY.
```

```
;
 END ELSE BEGIN
    N = FLOAT(N_ELEMENTS(ARRAY))
    N = N < 100. < (7.*ALOG10(N) + N/8.)
;
;  Use N to determine the spacing of the histogram levels.  Break this number
;  down into mantissa and exponent.
;
    DELTA = (A_MAX - A_MIN) / (N - 1)
    POWER = FIX(ALOG10(DELTA))
    IF POWER GT ALOG10(DELTA) THEN POWER = POWER - 1
    DELTA = DELTA / 10.^POWER
;
;  Ensure that the spacing of the histogram levels is either 1,2 or 5 times
;  some power of ten.
;
    VAL = [10,5,2]
    VALUE = 1
    FOR I = 0,2 DO IF VAL(I) GT DELTA THEN VALUE = VAL(I)
    DELTA = VALUE * 10.^POWER
;
;  If ARRAY is of some integer type (byte, integer or long), then ensure that
;  DELTA is at least one.
;
    TYPE = SIZE(ARRAY)
    TYPE = TYPE(TYPE(0) + 1)
    IF ((TYPE EQ 1) OR (TYPE EQ 2) OR (TYPE EQ 3)) THEN $
     DELTA = DELTA > 1
 ENDELSE
;
;  Find the nearest multiple of DELTA which is LE the minimum of ARRAY.
;
 I_MIN = LONG(A_MIN / DELTA)
 IF I_MIN*DELTA GT A_MIN THEN I_MIN = I_MIN - 1
 A_MIN = I_MIN * DELTA
;
;  Form the histogram, and the variable STEPS.
;
 HISTO = HISTOGRAM(LONG((ARRAY - A_MIN) / DELTA))
 STEPS = INDGEN(N_ELEMENTS(HISTO))*DELTA + A_MIN
;
 RETURN
 END
 ============================================================
==================
 PRO PLOTBAR,X,Y,TITLE=TITLE,XTITLE=XTITLE,YTITLE=YTITLE, $
  BCOLOR=BCOLOR, XTYPE=XTYPE,YTYPE=YTYPE,XRANGE=XRANGE, $
  YRANGE=YRANGE
```

```
;+
; Project     : SOHO - CDS
;
; Name        : PLOTBAR
;
; Purpose     : Plot a bar graph filled in with a pattern.
;
; Category    : Class3, Graphics
;
; Explanation :
;
; Syntax      : PLOTBAR, [ X ,]  Y
;
; Examples    :
;
; Inputs      : Y = array of values along the Y axis.
;
; Opt. Inputs : X = optional array of values along the X axis.  Y(i) is plotted
;       from X(i) to X(i+1), with the last point being plotted over
;       a distance equal to its predecessor.  The procedure tests
;       whether or not the second parameter passed is a vector to
;       decide if X was passed.  If not passed, then INDGEN(Y) is
;       assumed.
;
;  If !BCOLOR is nonzero, then it controls the color of the filled
;  in region.
;
; Outputs     : None.
;
; Opt. Outputs: None.
;
; Keywords    : TITLE = Main plot title, default is !P.TITLE.
;  XTITLE = X axis title, default is !X.TITLE.
;  YTITLE = Y axis title, default is !Y.TITLE.
;  XTYPE = If set, then X axis is logarithmic.
;  YTYPE = If set, then Y axis is logarithmic.
;  BCOLOR = Color to use instead of !BCOLOR for bar interiors.
;  XRANGE = Range of data values in the X direction.
;  YRANGE = Range of data values in the Y direction.
;
; Calls       : POLYFILL
;
; Common      : None.
;
; Restrictions: The variables must not be of type string.
;
; Side effects: None.
;
```

```
; Prev. Hist. :
; William Thompson Applied Research Corporation
; July, 1986  8201 Corporate Drive
;    Landover, MD  20785
;
; William Thompson, December 1991, added keywords XTYPE and YTYPE.
; W.T.T., May 1992, added BCOLOR keyword.
; William Thompson, May 1992, added keywords XRANGE and YRANGE.
; William Thompson, November 1992, modified to be compatible with
;  !P.MULTI.
; William Thompson, January 1993, modified to use modern system parameter
;  names.
; William Thompson, 30 April 1993, fixed bug with !P.MULTI.
;
; History     : Version 1, 22-Jan-1996, William Thompson, GSFC
;   Incorporated into CDS library
;
; Contact     : WTHOMPSON
;-
;
 ON_ERROR,2
;
 PSYM = !PSYM
 LINETYPE = !LINETYPE
 C = !C
;
 IF N_PARAMS(0) EQ 1 THEN BEGIN   ;Only Y array passed.
  XX = FINDGEN(N_ELEMENTS(X))
  YY = X
 END ELSE IF N_PARAMS(0) EQ 2 THEN BEGIN
  XX = X
  YY = Y
 END ELSE BEGIN
  PRINT,'*** PLOTBAR must be called with 1-2 parameters:'
  PRINT,'                [ X ,]  Y'
  RETURN
 ENDELSE
;
 M = N_ELEMENTS(XX) < N_ELEMENTS(YY)
 IF M LE 1 THEN BEGIN
  PRINT,'*** Not enough points to plot, routine PLOTBAR.'
  RETURN
 ENDIF
;
;  Generate the arrays used in plotting.  Fill in X array so that last
;  bar has same width as previous one.
;
 I = FINDGEN(2*M)/2
```

```
 X_LAST = 2*XX(M-1) - XX(M-2)
 XX = [XX(I),X_LAST,X_LAST]
 YY = [0,YY(I),0]
;
 !PSYM=0     ;Save system variables.
 !LINETYPE = 0
 !C = 0
;
;  Do the initial plot, keeping track of the setting of !P.MULTI.
;
 PMULTI = !P.MULTI
 COMMAND = "PLOT,XX,YY"
 IF N_ELEMENTS(XTITLE) EQ 1 THEN COMMAND = COMMAND + ",XTITLE=XTITLE"
 IF N_ELEMENTS(YTITLE) EQ 1 THEN COMMAND = COMMAND + ",YTITLE=YTITLE"
 IF N_ELEMENTS(TITLE)  EQ 1 THEN COMMAND = COMMAND + ",TITLE=TITLE"
 IF N_ELEMENTS(XTYPE)  EQ 1 THEN COMMAND = COMMAND + ",XTYPE=XTYPE"
 IF N_ELEMENTS(YTYPE)  EQ 1 THEN COMMAND = COMMAND + ",YTYPE=YTYPE"
 IF N_ELEMENTS(XRANGE) EQ 2 THEN COMMAND = COMMAND + ",XRANGE=XRANGE"
 IF N_ELEMENTS(YRANGE) EQ 2 THEN COMMAND = COMMAND + ",YRANGE=YRANGE"
 TEST = EXECUTE(COMMAND)
;
 XX = !CXMIN > XX < !CXMAX
 YY = !CYMIN > YY < !CYMAX
; IF N_ELEMENTS(BCOLOR) NE 1 THEN BCOLOR = !BCOLOR
 IF N_ELEMENTS(BCOLOR) NE 1 THEN BCOLOR = !COLOR
 IF BCOLOR EQ 0 THEN COLOR=!COLOR ELSE COLOR=BCOLOR
;
;  Fill in histogram and overplot boundary to restore color.
;
 POLYFILL,XX,YY,/DATA,COLOR=COLOR
 NOERAS = !NOERAS
 !NOERAS = -1
 XTITLE = !X.TITLE  &  !X.TITLE = ''
 YTITLE = !Y.TITLE  &  !Y.TITLE = ''
 PTITLE = !P.TITLE  &  !P.TITLE = ''
 !P.MULTI = PMULTI
;
 COMMAND = "PLOT,XX,YY"
 IF N_ELEMENTS(XTYPE)  EQ 1 THEN COMMAND = COMMAND + ",XTYPE=XTYPE"
 IF N_ELEMENTS(YTYPE)  EQ 1 THEN COMMAND = COMMAND + ",YTYPE=YTYPE"
 IF N_ELEMENTS(XRANGE) EQ 2 THEN COMMAND = COMMAND + ",XRANGE=XRANGE"
 IF N_ELEMENTS(YRANGE) EQ 2 THEN COMMAND = COMMAND + ",YRANGE=YRANGE"
 TEST = EXECUTE(COMMAND)
;
;  Modify !P.MULTI.  Normally, this would happen automatically, but this has
;  been disabled for this routine.
;
 K = !P.MULTI(0)
```

```
 NX = !P.MULTI(1) > 1
 NY = !P.MULTI(2) > 1
 IF (K LE 0) OR (K GT NX*NY) THEN K = NX*NY
 !P.MULTI(0) = (K - 1) MOD (NX*NY)
;
 !NOERAS = NOERAS
 !X.TITLE = XTITLE  &  !Y.TITLE = YTITLE  &  !P.TITLE = PTITLE
 OPLOT,[!CXMIN,!CXMAX],[0,0]   ;Plot zero line.
;
 !PSYM = PSYM
 !LINETYPE = LINETYPE
 !C = C
;
 RETURN
 END
```

Subject: Re: Question on plotting a histogram with original values
Posted by davidf on Thu, 06 Feb 1997 08:00:00 GMT
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David van Kuijk <kuijk@mpi.nl> writes:

> When I use the histogram-function I find it very annoying that I can't see
> which range of data has been put in which bin. Has anybody written a
> function which returns these values, or the mean values for each bin?
>
> To give an example:
> PRO testHisto
>
> testAr = [-44,0,-42,-58,-48,-25,-26,-1,-46,-36,-16,-55,-6,-81,10,-31, -38,$
>
 -34,-49,-80,2,-40,-65,-3,10,-31,-85,-34,-27,-14,-41,-73,-67, 3,-51,$
> -6,0,-107,-7,-36,-33,-59,-2,-99,-22]
> testHisto = histogram(testAr, BINSIZE = 10)
> plot, testHisto, PSYM = 10
> END
>
> This program will plot a nice histogram, but the values on the x-axis just
> show the rank number of the bins, and the information on the ranges of the
> original data is lost.

Try this modification to your program, David.

```
  PRO testHisto

  testAr =  [-44,0,-42,-58,-48,-25,-26,-1,-46,-36,-16,-55,-6,-81,10,-31, -38,$
```

```
 -34,-49,-80,2,-40,-65,-3,10,-31,-85,-34,-27,-14,-41,-73,-67, 3,-51,$
              -6,0,-107,-7,-36,-33,-59,-2,-99,-22]
  testHisto = histogram(testAr, BINSIZE = 10)
  s = SIZE(testHisto)
  maxData = MAX(testAr, MIN=minData)
  x = FINDGEN(s(1)) * ((maxData - minData)/(s(1)-1)) + minData
  plot, x, testHisto, PSYM = 10, XSTYLE=1
  END
```

Cheers!

David

David Fanning, Ph.D.
Fanning Software Consulting
2642 Bradbury Court, Fort Collins, CO 80521
Phone: 970-221-0438 Fax: 970-221-4762
E-Mail: davidf@dfanning.com
Coyote's Guide to IDL Programming: http://www.dfanning.com