
Subject: Re: Anyone doing color-filled contours in IDL?

Posted by [sterne](#) on Mon, 13 Sep 1993 18:26:03 GMT

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>>>> > "Paul" == Paul Schopf <paul@nino.gsfc.nasa.gov> asks:

Paul> Does anyone have a working procedure to do color-filled

Paul> contours?

Here are a couple of routines which I use for filled contours:

POLYCNTR1 is a replacement for the standard POLYCONTOUR routine.

CONTOUR1 is a wrapper around the standard CONTOUR call. For example,

```
CONTOUR1,DATA,/fill
```

will automatically create a filled contour plot.

I believe that IDL now has a /fill option on contour, and I don't know about the current version of PV-Wave, so this may only be useful to people who are stuck with older versions.

Features of POLYCNTR1:

1. Fills contours in decreasing order of area, so it does not hide one filled area with another.
2. Fills open contours as well as closed contours. No need to artificially close the contours around the edge.
3. Fills for both rectangular and warped rectangular grids.

Note on CONTOUR1:

You may need to alter the number of keywords in contour1 to get it to run on your system (particularly with PV-Wave 3.1 and before). See the comments in CONTOUR1 for more details.

I'd be grateful for feedback, bug reports and fixes etc.

Phil

```
PRO polycntr1, filename, Z, X, Y, color_index = color_index, pattern = pat $
```

```

        , delete_file = delfile
;+
; NAME: POLYCNTR1
; PURPOSE:
; Fill the contours defined by a path file created by CONTOUR.
; CATEGORY:
; Graphics.
; CALLING SEQUENCE:
; POLYCNTR1, Filename, Z [, X, Y, COLOR_INDEX = color index]
; INPUTS:
; Filename = name of file containing contour paths. This
; file must have been made using CONTOUR, PATH=Filename, ...
;
;     Z = 2 dimensional data array used to generate the contours.
;
;
; X = vector or 2 dimensional array specifying the X coordinates
; for the contour surface. If a vector, each element specifies the
; X coordinate for a column of Z (Example: X(0) specifies the X
; coordinate for Z(0,*)). If X is a two-dimensional array, each
; element of X specifies the X coordinate of the corresponding
; point in Z ( X(i,j) specifies the X coordinate for Z(i,j)).
;
;
; Y = as for X above, but for the Y coordinates.
;
;
; KEYWORD PARAMETERS:
; COLOR_INDEX = color index array. Element i contains the color
; of contour level number i-1. Element 0 contains the
; background color. There must be one more color index than
; levels.
; PATTERN = optional array of patterns, dimensioned (NX, NY, NPATTERN).
;     DELETE_FILE If present and non-zero, delete FILENAME once contours
;         are read.
; OUTPUTS:
; The contours are filled on the display using normalized
; coordinates using the POLYFILL procedure.
; COMMON BLOCKS:
; None.
; SIDE EFFECTS:
; Contour temp file filename.tmp created in current directory.
; Display is updated.
; PROCEDURE:
; Scans file. Eliminates contours of 1 or 2 points. Open contours
;     are closed clockwise and counterclockwise around the plot border
; and both contours are written to the contour temp file. Area
;     of the two plots and starting bytes in the contour temp file
;     are both noted. The 2 dimensional array Z is used to determine
; which of these 2 contours encloses the higher ground. Closed

```

```

; contours are written directly to the contour temp file. Areas
; are sorted and contours are reread from the contour temp file
; and drawn in order of decreasing area.
; EXAMPLE:
; Create a 10 by 10 array of random numbers, contour to get
; path file, polycontour it, then overdraw the contour lines:
; b = RANDOMU(seed, 10,10) ;Insert random numbers
; CONTOUR, b, /SPLINE, PATH = 'path.dat' ;Make path file
; POLYCNR1, 'path.dat',b ;Fill contours
; CONTOUR, b, /SPLINE, /NOERASE ;Overplot lines & labels
;
; Note: result looks best if the plot region is filled with data.
; Setting xstyle=1, ystyle=1, on CONTOUR accomplishes this.
; Contours are only filled for the region spanned by the data.
; MODIFICATION HISTORY:
; DMS, AH, January, 1989.
; PAS = P. A. Sterne, Sterne1@llnl.gov
; PAS, LLNL, October 1991. Shades in order of contour area.
; PAS, LLNL, November 1992. Shades open contours too.
; PAS, LLNL, March 1993. Added in X,Y, and bugfixes.
;-

```

```

header = {contour_header,$
type : 0B, $
high_low : 0B, $
level : 0, $
num : 0L, $
value : 0.0 }

```

```

tol = 1.e-5
asize = 100 ;# of elements in contour arrays
n = 0
cval = 0 ;Contour index
carea = fltarr(asize) ;Contour area
cstart = lonarr(asize) ;Starting byte of record
dtog0 = [!X.s(0), !Y.s(0)]
dtog1 = [!X.s(1), !Y.s(1)]
pos = fltarr(4)

```

```

sz = size(Z)
IF sz(0) NE 2 THEN BEGIN
    print, 'POLYCNR1: Data array is not 2 dimensional. Returning'
    RETURN
ENDIF

```

```

regularxy = 0 ;zero for x,y vectors or not passed

```

```

CASE n_params() OF

```

```

2: BEGIN          ; X and Y not passed to POLYCNTR2
  x1 = findgen(sz(1))    ; make X a vector
  y1 = findgen(sz(2))    ; make Y a vector
END

```

```

3: BEGIN          ; X passed as argument, but not Y
  szx = size(x)
  x1 = x
  IF szx(0) EQ 1 THEN y1 = findgen(sz(2)) $ ; make Y a vector
  ELSE IF szx(0) EQ 2 THEN BEGIN
    y1 = replicate(1.0, sz(1))#findgen(sz(2)) ; make Y an array
    regularxy = 1
  ENDIF
END

```

```

4: BEGIN          ;X and Y both passed as arguments
  x1 = x
  y1 = y
  szx = size(x)
  szy = size(y)
  IF max([szx(0), szy(0)]) EQ 2 THEN BEGIN
    regularxy = 1
    IF szx(0) EQ 1 THEN x1 = x#replicate(1.0, sz(2)) ; make X an array
    IF szy(0) EQ 1 THEN y1 = replicate(1.0, sz(1))#y ; make Y an array
  ENDIF
END

```

ENDCASE

```

IF regularxy EQ 0 THEN BEGIN
  pos = [dtog0+[x1(0), y1(0)]*dtog1, dtog0+[x1(sz(1)-1), y1(sz(2)-1)]*dtog1]
  scalexy = [min(abs(x1-shift(x1, 1))),min(abs(y1-shift(y1,1)))]*0.01
ENDIF ELSE BEGIN
  isx = indgen(sz(1))
  isy = sz(1)*(indgen(sz(2))-2)+1
  bpts = [isx,isy+sz(1)-1,rotate(isx,2)+sz(1)*(sz(2)-1),rotate(isy,2) ]
  nbpts = 2*(sz(1)+sz(2)-2)
  xy2 = [[x1(bpts)], [y1(bpts)]]
  z2 = z(bpts)
  xyn = fltarr(2, nbpts)
  FOR i = 0, nbpts-1 DO xyn(*, i) = xy2(i, *)*dtog1 + dtog0
  scale = 0.01*min(sqrt(sum((shift(xy2, 1, 0)-xy2)^2, 1)))
  corners = [ 0, sz(1)-1,sz(1)+sz(2)-2,2*sz(1)+sz(2)-3]
  xpoly = fltarr(4)
  zpoly = fltarr(4)

```

ENDELSE

```

xyvert = pos([[0, 1], [2, 1], [2, 3], [0, 3]])
vlist = shift(pos,-1)
openr,unit,filename,/get_lun,delete=KEYWORD_SET(delfile)
openw,unit2,filename+'.tmp',/get_lun,/delete

while (not eof(unit)) do begin ;First pass reading contours

    IF n EQ asize THEN BEGIN ;Expand our arrays?
        cstart = [cstart, cstart]
        carea = [carea, carea]
        asize = 2 * asize
    ENDIF

    a = fstat(unit2) ;File position
    readu, unit, header ;Read header
    IF (header.type EQ 0 AND header.num GT 1) THEN BEGIN ; Open contours
        cval = cval > fix(header.level) ; contour level
        xyarr = ftarr(2, header.num) ; Contour polygon
        hn = header.num - 1
        header1 = header
        header2 = header
        header1.type = 1 ;Reset header type to closed contour.
        header2.type = 1 ;Reset header type to closed contour.
        readu, unit, xyarr

        IF regularxy EQ 0 THEN BEGIN

; determine which side the open contour enters (side1) and exits (side2).

            xlst = [[1, 0, 1, 0], [2*hn+1, 2*hn, 2*hn+1, 2*hn]]
            sid1 = where(abs(xyarr(xlst(*, 0))-vlist) LT tol, count1)
            sid2 = where(abs(xyarr(xlst(*, 1))-vlist) LT tol, count2)
            IF count1 LE 0 AND header.num GT 2 THEN print, $
                'error open contour side1, n= ',n,' vertex=', xyarr(*, 0)
            IF count2 LE 0 AND header.num GT 2 THEN print, $
                'error open contour side2, n= ',n,' vertex=', xyarr(*, hn)
            IF (count1 LE 0) OR (count2 LE 0) THEN GOTO, RDREC

; close open contour

            side1 = max(sid1) ; side contour enters
            side2 = max(sid2) ; side contour exits
            vadd = shift(xyvert, 0, -side2-1)
            tmp = reverse(vadd, 2)

; close contour counter-clockwise (xyarr1) and clockwise (xyarr2)

```

```

ivt = (-side2+side1+4) MOD 4
IF ivt EQ 0 THEN BEGIN ; same side
  dotdir = total((xyarr(*, hn)-xyarr(*, 0))*(vadd(*, 3)-vadd(*, 0)))
  IF dotdir LT 0 THEN ivt = 4 - ivt
ENDIF
xyarr1 = fltarr(2, hn+2+ivt)
xyarr2 = fltarr(2, hn+6-ivt)
header1.num = hn + 2 + ivt
header2.num = hn + 6 - ivt

```

```

IF ivt NE 0 THEN xyarr1(*, hn+1:hn+ivt) = vadd(*, 0:ivt-1)
IF ivt NE 4 THEN xyarr2(*, hn+1:hn+4-ivt) = tmp(*, 0:3-ivt)

```

```

xyarr1(*, 0:hn) = xyarr
xyarr2(*, 0:hn) = xyarr
xyarr1(*, header1.num-1) = xyarr(*, 0)
xyarr2(*, header2.num-1) = xyarr(*, 0)

```

; Check which of xyarr1/2 is higher.

```

sdxy = side2 MOD 2 ; 0 for side2=0,2; 1 for side2=1,3
sdsign = -2*(side2/2) + 1 ; +1 for side2=0,1 and -1 side2=2,3
dta = (xyarr(*, hn)-dtog0)/dtog1
IF sdxy EQ 0 THEN BEGIN
  vmin = min(abs(x1-dta(0)), it1)
  it1 = it1 > 1 < (sz(1)-2)
  it2 = ([-1, 0, 1]+it1)
  xpoly = [x1(it2), dta(0)] - dta(0)
  zpoly = [z(it2, (side2/2)*(sz(2)-1)), header.value]
ENDIF ELSE BEGIN
  vmin = min(abs(y1-dta(1)), it1)
  it1 = it1 > 1 < (sz(2)-2)
  it2 = ([-1, 0, 1]+it1)
  xpoly = [y1(it2), dta(1)] - dta(1)
  zpoly = [reform(z(((sdsign+1)/2)*(sz(1)-1), it2)), header.value]
ENDELSE
xsplin = xpoly(sort(xpoly))
zsplin = zpoly(sort(xpoly)) - header.value
dtsplin = [-1., 1.]*scalexy(sdxy)
val = rotate(spline(xsplin, zsplin, dtsplin), 2-2*(side2/2))
ind = [0B, 0B]
FOR i = 0, 1 DO IF val(i) GT 0. THEN ind(i) = 1b
IF ind(0) EQ ind(1) THEN print, ' both sides min or max, n=', n

```

; Check which of xyarr1/2 is higher. Add & subtract 0.005 of the +ve side
; vector to the last xyarr point. Adding puts point in xyarr1, subtracting
; puts it in xyarr2. If xyarr1 pt > xyarr2 pt, then color = c for xyarr1
; and c-1 for xyarr2. Reverse for xyarr1 pt < xyarr2 pt.

```
ENDIF ELSE BEGIN ; 2 dimensional X and Y arrays
```

```
; determine the boundary points on either side of the open contour  
; where it enters (ptba1) and exits (ptba2).
```

```
dta1 = (xyarr(*, 0)-dtog0)/dtog1  
dta2 = (xyarr(*, hn)-dtog0)/dtog1  
vmin1 = min(((xy2(*,0)-dta1(0))^2+(xy2(*,1)-dta1(1))^2), it1)  
vmin2 = min(((xy2(*,0)-dta2(0))^2+(xy2(*,1)-dta2(1))^2), it2)  
itp1 = (it1 + 1) MOD nbpts  
itm1 = (it1 - 1 + nbpts) MOD nbpts  
itp2 = (it2 + 1) MOD nbpts  
itm2 = (it2 - 1 + nbpts) MOD nbpts  
grdp1 = xy2(itp1, *) - xy2(it1, *)  
grdm1 = xy2(itm1, *) - xy2(it1, *)  
grdp2 = xy2(itp2, *) - xy2(it2, *)  
grdm2 = xy2(itm2, *) - xy2(it2, *)  
diff1 = dta1 - xy2(it1, *)  
diff2 = dta2 - xy2(it2, *)  
IF total(diff1*diff1) GT tol THEN BEGIN  
  dir1 = [total(grdp1*diff1), total(grdm1*diff1)]  
  a1 = min(dir1/[total(grdp1*grdp1), total(grdm1*grdm1)], indir1)  
  ptba1 = [it1-indir1, it1-indir1+1] ; bndry pt [below,above]  
ENDIF ELSE ptba1 = [it1, it1]  
indir2 = 0  
IF total(diff2*diff2) GT tol THEN BEGIN  
  dir2 = [total(grdp2*diff2), total(grdm2*diff2)]  
  a1 = max(dir2/[total(grdp2*grdp2), total(grdm2*grdm2)], indir2)  
  ptba2 = [it2-indir2, it2-indir2+1] ; contour boundary pt.  
ENDIF ELSE ptba2 = [it2, it2]
```

```
; close contour counter-clockwise (xyarr1) and clockwise (xyarr2)
```

```
xy3 = shift(xyn, 0,-ptba2(1))  
ptba1m = (ptba1 + nbpts - ptba2(1)) MOD nbpts  
xyarr1 = [[xyarr], [xy3(*, 0:ptba1m(0))], [xyarr(*, 0)]]  
xyarr2 = [[xyarr], [reverse(xy3(*, ptba1m(1):nbpts-1), 2)], [xyarr(*, 0)]]  
header1.num = (size(xyarr1))(2)  
header2.num = (size(xyarr2))(2)
```

```
; Check which of xyarr1/2 is higher.
```

```
pt2 = ([it2-1, it2, it2+1]+nbpts) MOD nbpts  
FOR i = 0, 3 DO IF (it2 EQ corners(i)) THEN BEGIN  
  IF indir2 EQ 0 THEN pt2 = (pt2+1) MOD nbpts  
  IF indir2 EQ 1 THEN pt2 = (pt2-1+nbpts) MOD nbpts  
ENDIF
```

```

FOR i = 0, 2 DO xpoly(i) = sqrt(total((xy2(pt2(i), *)-dta2)^2))
xpoly(0) = -xpoly(0)
xpoly(1) = (2*indir2-1)*xpoly(1)
xpoly(3) = 0.0
zpoly(0:2) = z2(pt2)
zpoly(3) = header.value
xsplin = xpoly(sort(xpoly))
zsplin = zpoly(sort(xpoly))
dtsplin = [-1., 1.]*scale
val = rotate(spline(xsplin, zsplin, dtsplin), 2)
ind = [0B, 0B]
FOR i = 0, 1 DO IF val(i) GT header.value THEN ind(i) = 1b
IF ind(0) EQ ind(1) THEN print, $
' 2-dim: both sides min or max, n=', n

```

ENDELSE

```

header1.high_low = ind(0)
cstart(n) = a.cur_ptr ;Position
carea(n) = poly_area(xyarr1(0, *), xyarr1(1, *))
writeu, unit2, header1
writeu, unit2, xyarr1
n = n + 1
a = fstat(unit2) ;File position
header2.high_low = ind(1)
cstart(n) = a.cur_ptr ;Position
carea(n) = poly_area(xyarr2(0, *), xyarr2(1, *))
writeu, unit2, header2
writeu, unit2, xyarr2
n = n + 1

```

ENDIF ELSE IF (header.num LE 2) THEN BEGIN ;Skip short contours

```
xyarr = fltarr(2, header.num)
```

```
readu, unit, xyarr
```

ENDIF ELSE BEGIN ;Closed contour

```
cval = cval > fix(header.level) ;Color to draw
```

```
cstart(n) = a.cur_ptr ;Position
```

```
xyarr = fltarr(2, header.num) ;Define point to skip
```

```
readu, unit, xyarr
```

```
carea(n) = poly_area(xyarr(0, *), xyarr(1, *))
```

```
writeu, unit2, header ;Write header
```

```
writeu, unit2, xyarr
```

```
n = n + 1
```

ENDELSE

RDREC:

ENDWHILE ; End of contour file

```
free_lun, unit
```



```

;print, 'cval=', cval      ; max contour index ( = #contours-1)
cstart = cstart(0:n-1)    ; Truncate
carea = carea(0:n-1)
order = rotate(sort(carea), 2) ;Subscripts of order
c_index = bindgen(cval+2)*byte(float(!D.n_colors)/(cval+1))
if keyword_set(color_index) eq 0 then color_index = c_index
if max(color_index) lt 0 then color_index = c_index

for i=0,n-1 do begin ;Draw each contour
  j = order(i) ;Index of record
  point_lun,unit2,cstart(j)
  readu,unit2,header ;Reread header
  xyarr = fltarr(2, header.num) ;Define polygon array
  readu,unit2,xyarr ;Read polygon
  inds = fix(header.level) + fix(header.high_low)
  col = color_index(inds) ;Drawing color

  IF N_ELEMENTS(pat) NE 0 THEN BEGIN
    s = size(pat)
    if s(0) ne 3 then begin
      print,'POLYCONTR1 - pattern array not 3d'
      return
    endif

    polyfill,/NORMAL, pattern=pat(*,*, i mod s(3)), xyarr
  endif else $
    polyfill, /NORMAL, color= col,xyarr ;Fill contour
endfor
free_lun, unit2 ;Done
end

```

```

;+
; NAME: CONTOUR1
; PURPOSE: Generate contour plot with or without filling the contours.
; Provides a wrapper which calls CONTOUR and optionally POLYCONTR1.
; CATEGORY: Display
; CALLING SEQUENCE: Contour1, Z [, X, Y ,fill=fill and lots of other keywords]
; INPUTS:
;
; Z: Two dimensional data array used to generate the contours.
;
; OPTIONAL INPUT PARAMETERS:
;
; X = vector or 2 dimensional array specifying the X coordinates
; for the contour surface. If a vector, each element specifies the

```

```

; X coordinate for a column of Z (Example: X(0) specifies the X
; coordinate for Z(0,*)). If X is a two-dimensional array, each
; element of X specifies the X coordinate of the corresponding
; point in Z ( X(i,j) specifies the X coordinate for Z(i,j)).
;
; Y = as for X above, but for the Y coordinates.
;
; KEYWORD PARAMETERS: All keywords of contour, plus:
;
; COLOR_INDEX = color index array. Element i contains the color
; of contour level number i-1. Element 0 contains the
; background color. There must be one more color index than
; levels.
;   FILL:   If non-zero, contours are filled using POLYCNTR1
;   PATTERN = optional array of patterns, dimensioned (NX, NY, NPATTERN).
; OUTPUTS: None
; OPTIONAL OUTPUT PARAMETERS: None
; COMMON BLOCKS: None
; SIDE EFFECTS: Changes display.
; RESTRICTIONS:
; PROCEDURE:
; MODIFICATION HISTORY: Written PA Sterne (sterne1@llnl.gov) February 1993
;-
PRO contour1, Z, X, Y, $
;
; "Essential" keywords
;
fill=fill,color_index=color_index,pattern=pattern,$
c_colors=c_colors, follow=follow, noerase=noerase, path_filename=path_filename,$
;
; Eliminateable keywords. Any of these may be commented out along with
; the corresponding keyword_set line below. Comment out at least 9
; keywords of your choice to make it fit in PV-Wave's parameter limit.
; No such limit exists in IDL.
;
background=background, charsize=charsize, clip=clip, color=color,$
c_annotation=c_annotation, c_charsize=c_charsize, c_labels=c_labels,$
c_linestyle=c_linestyle, c_thick=c_thick, data=data, device=device, fancy=fancy,$
font=font, levels=levels, max_value=max_value, nlevels=nlevels, $
noclip=noclip, noerase=noerase, normal=normal, overplot=overplot, $
position=position, psym=psym, spline=spline, subtitle=subtitle, $
symsize=symsize, t3d=t3d, thick=thick, ticklen=ticklen, title=title,$
xcharsize=xcharsize, xmargin=xmargin, xminor=xminor, xrange=xrange,$
xstyle=xstyle, xtckname=xtckname, xtck=xtck, xtckv=xtckv, xtitle=xtitle,$
ycharsize=ycharsize, ymargin=ymargin, yminor=yminor, yrange=yrange,$
ystyle=ystyle, ytckname=ytckname, ytck=ytck, ytckv=ytckv, ytitle=ytitle,$
zcharsize=zcharsize, zmargin=zmargi n, zminor=zminor, zrange=zrange,$
zstyle=zstyle, ztckname=ztckname, ztck=ztck, ztckv=ztckv, ztitle=ztitle,$

```

zaxis=zaxis,zvalue=zvalue

```
strkw = "  
;  
; "Essential" keyword_set lines  
;  
;  
if keyword_set(noerase) then strkw = strkw+',noerase=noerase'  
if keyword_set(follow) then strkw = strkw+',follow=follow'  
;  
;  
; Elimlatable keyword_set lines. Comment out in correspondence with  
; keywords above.  
;  
;  
if keyword_set(background) then strkw = strkw+',background=background'  
if keyword_set(charsize) then strkw = strkw+',charsize=charsize'  
if keyword_set(clip) then strkw = strkw+',clip=clip'  
if keyword_set(color) then strkw = strkw+',color=color'  
if keyword_set(c_annotation) then strkw = strkw+',c_annotation=c_annotation'  
if keyword_set(c_charsize) then strkw = strkw+',c_charsize=c_charsize'  
if keyword_set(c_labels) then strkw = strkw+',c_labels=c_labels'  
if keyword_set(c_linestyle) then strkw = strkw+',c_linestyle=c_linestyle'  
if keyword_set(c_thick) then strkw = strkw+',c_thick=c_thick'  
if keyword_set(data) then strkw = strkw+',data=data'  
if keyword_set(device) then strkw = strkw+',device=device'  
if keyword_set(fancy) then strkw = strkw+',fancy=fancy'  
if keyword_set(font) then strkw = strkw+',font=font'  
if keyword_set(levels) then strkw = strkw+',levels=levels'  
if keyword_set(max_value) then strkw = strkw+',max_value=max_value'  
if keyword_set(nlevels) then strkw = strkw+',nlevels=nlevels'  
if keyword_set(noclip) then strkw = strkw+',noclip=noclip'  
if keyword_set(nodata) then strkw = strkw+',nodata=nodata'  
if keyword_set(normal) then strkw = strkw+',normal=normal'  
if keyword_set(overplot) then strkw = strkw+',overplot=overplot'  
if keyword_set(position) then strkw = strkw+',position=position'  
if keyword_set(psym) then strkw = strkw+',psym=psym'  
if keyword_set(spline) then strkw = strkw+',spline=spline'  
if keyword_set(subtitle) then strkw = strkw+',subtitle=subtitle'  
if keyword_set(symsize) then strkw = strkw+',symsize=symsize'  
if keyword_set(t3d) then strkw = strkw+',t3d=t3d'  
if keyword_set(thick) then strkw = strkw+',thick=thick'  
if keyword_set(ticklen) then strkw = strkw+',ticklen=ticklen'  
if keyword_set(title) then strkw = strkw+',title=title'  
if keyword_set(xcharsize) then strkw = strkw+',xcharsize=xcharsize'  
if keyword_set(xmargin) then strkw = strkw+',xmargin=xmargin'  
if keyword_set(xminor) then strkw = strkw+',xminor=xminor'  
if keyword_set(xrange) then strkw = strkw+',xrange=xrange'  
if keyword_set(xstyle) then strkw = strkw+',xstyle=xstyle'  
if keyword_set(xtickname) then strkw = strkw+',xtickname=xtickname'  
if keyword_set(xticks) then strkw = strkw+',xticks=xticks'
```

```

if keyword_set(xtickv) then strkw = strkw+',xtickv=xtickv'
if keyword_set(xtitle) then strkw = strkw+',xtitle=xtitle'
if keyword_set(ycharsize) then strkw = strkw+',ycharsize=ycharsize'
if keyword_set(ymargin) then strkw = strkw+',ymargin=ymargin'
if keyword_set(yminor) then strkw = strkw+',yminor=yminor'
if keyword_set(yrange) then strkw = strkw+',yrange=yrange'
if keyword_set(ystyle) then strkw = strkw+',ystyle=ystyle'
if keyword_set(ytickname) then strkw = strkw+',ytickname=ytickname'
if keyword_set(yticks) then strkw = strkw+',yticks=yticks'
if keyword_set(ytickv) then strkw = strkw+',ytickv=ytickv'
if keyword_set(ytitle) then strkw = strkw+',ytitle=ytitle'
if keyword_set(zcharsize) then strkw = strkw+',zcharsize=zcharsize'
if keyword_set(zmargin) then strkw = strkw+',zmargin=zmargin'
if keyword_set(zminor) then strkw = strkw+',zminor=zminor'
if keyword_set(zrange) then strkw = strkw+',zrange=zrange'
if keyword_set(zstyle) then strkw = strkw+',zstyle=zstyle'
if keyword_set(ztickname) then strkw = strkw+',ztickname=ztickname'
if keyword_set(zticks) then strkw = strkw+',zticks=zticks'
if keyword_set(ztickv) then strkw = strkw+',ztickv=ztickv'
if keyword_set(ztitle) then strkw = strkw+',ztitle=ztitle'
if keyword_set(zaxis) then strkw = strkw+',zaxis=zaxis'
if keyword_set(zvalue) then strkw = strkw+',zvalue=zvalue'

```

```

xy = ''
if n_params() eq 2 then xy = ',X'
if n_params() eq 3 then xy = ',X ,Y'

```

IF KEYWORD_SET(fill) THEN BEGIN ; fill contours

```
filename = 'cntrwave.dat'
```

```

if keyword_set(path_filename) then filename = path_filename
str1 = 'contour, Z'+xy+', path_filename=filename'+strkw

```

```
tr0 = execute(str1) ; call contour to generate path file
```

```

strpl = 'polycntr1,filename,Z'+xy
if keyword_set(color_index) then c_index = color_index $
  else c_index = replicate(-1,30)
strpl=strpl+',color_index=c_index'
if keyword_set(pattern) then strpl = strpl+',pattern=pattern'

```

```
tr = execute(strpl) ; call polycntr1 to shade contours
```

```

if n_elements(c_colors) eq 0 then begin ;set contour line colors
  c_colors = c_index(1:n_elements(c_index)-1)
  tmp1 = where(c_colors gt max(c_colors)*0.6)
  tmp2 = where(c_colors le max(c_colors)*0.6)

```

```
c_colors(tmp2) = 255b
c_colors(tmp1) = 0b
endif
strkw = strkw+',c_colors=c_colors'
```

```
; set keywords for second contour call to overdraw and to ensure
; consistency with pathfile generating contour call.
```

```
if keyword_set(noerase) eq 0 then strkw = strkw+',/noerase'
if keyword_set(follow) eq 0 then strkw = strkw+',/follow'
```

```
endif
```

```
str2 = 'contour, Z'+xy+strkw+'
```

```
tr1 = execute(str2)
```

```
return
```

```
end
```

```
--
```

```
-----
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```
