Everything You Need to Know to Run The Most Recent Program

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Contents

Introduction

If you read this document, you will understand what the commands/outputs are for the most recent sun centering program. That's it.

1 Main Program

The main program is called `alpha.pro` and spits out images in X11 windows and center positions in the terminal window.

Content of `alpha.pro` with coded in comments defined by lines starting with ';' and my comments within the LaTeX document starting with '**':

```
; docformat = 'rst '
PRO alpha
;+
;    : Description :
;       Finds the center of N whole suns and M partial suns using limb−fitting for the whole suns and simple centroiding for the partial suns
;
;    :Params:
;
;    :TODO:
;        NONE, BRAH
;
; idldoc , root='../ suncentering ', output='rbdoc',format_style='rst ',/ user,/ quiet ,markup_style='rst'
;−
**
** The command above produces html documentation on all the .pro files starting from the main directory and branching into all sub−directories with the IDLdoc program. The document markup syntax is reStructuredText, otherwise known as rst.
**

COMPILE_OPT idl2

; Our list of images to take centers of
wholeimage  = MRDFITS('../fits_files/dottedimage. fits ',/ sil )
w1_w2_p3  = MRDFITS('../fits_files/ partial3rd . fits ',/ sil )
w1_p2_p3  = MRDFITS('../fits_files/2 partials . fits ',/ sil )
reg12       = MRDFITS('../fits_files/1_2. fits ',/ sil )
reg13       = MRDFITS('../fits_files/1_3. fits ',/ sil )
reg23       = MRDFITS('../fits_files/2_3. fits ',/ sil )
w2_p3       = MRDFITS('../fits_files/w2_p3.fits',/ sil )
p1_w2_w3  = MRDFITS('../fits_files/p1_w2_w3.fits',/sil)
p1_w2_p3  = MRDFITS('../fits_files/p1_w2_p3.fits',/sil)
p1_p2_w3  = MRDFITS('../fits_files/p1_p2_w3.fits',/sil)
w1_p2_w3  = MRDFITS('../fits_files/w1_p2_w3.fits',/sil)
p1_w3       = MRDFITS('../fits_files/p1_w3.fits',/ sil )
p1_w2       = MRDFITS('../fits_files/p1_w2.fits',/ sil )
w1_p3       = MRDFITS('../fits_files/w1_p3.fits',/ sil )
brightsun   = MRDFITS('../fits_files/albsun. fits ',/ sil )
corner      = MRDFITS('../fits_files/corner. fits ',/ sil )
corner2     = MRDFITS('../fits_files/corner2. fits ',/ sil )
corner3     = MRDFITS('../fits_files/corner3. fits ',/ sil )
dimsun      = MRDFITS('../fits_files/sun2. fits ',/ sil )
 tritest    = MRDFITS('../fits_files/ tritest . fits ',/ sil )

**
** Each of these fits  files  is a byte image of a sun or multiple suns
**

; Toggling which image is going to be analyzed

startimage=wholeimage
; startimage=w1_w2_p3
; startimage=w1_p2_p3
; startimage=reg12
; startimage=reg23
; startimage=reg13
; startimage=w2_p3
; startimage=p1_w2_w3
; startimage=p1_w2_p3
; startimage=p1_p2_w3
; startimage=w1_p2_w3
; startimage=p1_w3
; startimage=p1_w2
; startimage=w1_p3
; startimage=brightsun   ;no param list for this one
startimage = dimsun
startimage = tritest

;  profiler
;  profiler ,/system
**
** We only used this when we were benchmarking the program for speed. As it is now, it should be fast enough.
**
; takes ~.07 s to run albert's triple sun image


 tic
defparams, 'pblock_albtritest.txt'
; defparams, 'pblock_albdimsun.txt'
; defparams, 'pblock_orig_small.txt'
** Here we load the parameter *.txt file and store all the variables into a global variable, !param **
toc
; .0005 to here
 defsysvarthresh, startimage
**
** With the variables just defined, we load the starting image, sort the 2D image into a 1D arary, chop off the top .1% pixels, then take the 2nd derivative and calculate thresholds. defsysvarthresh calls idsuns and setbetterpeak
**
toc
; .03 to here
grannysmith = everysun(startimage)
**
** With the thresholds defined from defsysvarthresh, we centroid whatever suns are in the image, regardless if they are in a bad position in the image.
**
toc
; .065 to here
 fuji = picksun_rot(startimage, grannysmith)
**
** Now we look at each solar center and make sure it's not too close to the edge of the image or the bottom corners.
**
toc
; .065 to here
 limbfittedcentroids =centroidwholesuns(fuji, startimage)
**
** With a list of ``good'' suns, we crop a box around the centers, making sure not to cut off any part of the sun. Then, we take 5 slices in each direction centered around the solar center. The locations of these chords that cross the limbs of the sun are fitted with a polynomial. Then, we take the midpoint of each chord bounded by where the polynomail crosses the threshold. We average the midpoints and get a limb-fitted center position.
**
toc
; .068 to here
bbb = para_fid(startimage, limbfittedcentroids )
**
** Now, with the limb-fitted center, we look analyze the sun for fiducials.
**
; .07 to here
toc
tmpimage = startimage

 if N_ELEMENTS(limbfittedcentroids) gt 1 then begin
     for i =0,N_ELEMENTS(limbfittedcentroids)-1 do begin
          tmpimage[limbfittedcentroids[i].limbxpos-1:limbfittedcentroids[i].limbxpos+1,*] = 255
          tmpimage[*,limbfittedcentroids[i].limbypos-1:limbfittedcentroids[i].limbypos+1] = 255
     endfor
endif else begin
     tmpimage[limbfittedcentroids[0].limbxpos-1:limbfittedcentroids[0].limbxpos+1,*] = 255
     tmpimage[*,limbfittedcentroids[0].limbypos-1:limbfittedcentroids[0].limbypos+1] = 255
endelse
```

```

**
** Here, we draw lines in the starting image corresponding to the X and Y positions of each sun.
**

; so the rough center is a bit off. Gasp! Why though?

;  profiler ,/ report ,data=data
;  profiler ,/ reset ,/ clear
;  print ,data[ sort (−data.time)],format='(A−20, I7, F12.5, F10.5, I9)'

**
** The format above is just so that we can see which use/IDL functions are taking up the most time so we can optimize our code
**

atmp = startimage

; So I have to highlight fiducials

for i = 0,N_ELEMENTS(bbb)−1 do begin
    for j = 0,N_ELEMENTS((∗(bbb[i])).fidarr)−1 do begin

        if ((∗(bbb[i])). fidarr )[j].subx ne 0 or ((∗(bbb[i])). fidarr)[j].suby ne 0 then begin
        atmp[((∗(bbb[i])). fidarr)[j].subx + limbfittedcentroids [i].limbxpos − !param.crop_box −1:((∗(bbb[i])). fidarr )[j].subx +
              limbfittedcentroids [i].limbxpos − !param.crop_box+1,((∗(bbb[i])). fidarr)[j].suby + limbfittedcentroids [i].limbypos −
             !param.crop_box−1:((∗(bbb[i])). fidarr)[j].suby + limbfittedcentroids [i].limbypos − !param.crop_box+1]=255
        endif
    endfor
endfor

**
** This for loop goes through each fiducial position and marks them white on the starting image
**

;  print ,' Main sun x pos :', limbfittedcentroids [0]. limbxpos
;  print ,' Main sun y pos :', limbfittedcentroids [0]. limbypos
;  print ,'50% sun x pos:  ', limbfittedcentroids [1]. limbxpos
;  print ,'50% sun y pos:  ', limbfittedcentroids [1]. limbypos
;  print ,'25% sun x pos:  ', limbfittedcentroids [2]. limbxpos
;  print ,'25% sun y pos:  ', limbfittedcentroids [2]. limbypos

window,0
cgimage,tmpimage,/k
window,1
cgimage,atmp,/k

ztmp = startimage
 tic
best4 = best4( limbfittedcentroids ,bbb)
**
** With the fiducial positions we calculated, we only care about the 4 closest to the solar center.
**
toc

for i = 0,n_elements(best4)−1 do begin
    for j = 0,n_elements(best4[i]. fidarr )−1 do begin
        ztmp[best4[i]. fidarr [j].subx + limbfittedcentroids [i].limbxpos − !param.crop_box −1:best4[i]. fidarr [j].subx +
              limbfittedcentroids [i].limbxpos − !param.crop_box+1,$
            best4[i]. fidarr [j].suby + limbfittedcentroids [i].limbypos − !param.crop_box−1:$
            best4[i]. fidarr [j].suby + limbfittedcentroids [i].limbypos − !param.crop_box+1]=255
    endfor
endfor

**
** Now, we highlight the best 4 fiducials for each sun
**
window,2
cgimage,ztmp,/k


print ,' Brightest sun center position : ', limbfittedcentroids [0]. limbxpos, limbfittedcentroids [0]. limbypos
```

```
print,'50% sun center position: ', limbfittedcentroids[1].limbxpos, limbfittedcentroids[1].limbypos
print,'25% sun center position: ', limbfittedcentroids[2].limbxpos, limbfittedcentroids[2].limbypos


stop
 idedfids = idfids(best4)



; What's going on here?

; cgimage,startimage[limbfittedcentroids[0].limbxpos-!param.crop_box:limbfittedcentroids[0].limbxpos+!param.crop_box,limbfittedcentroids[0].limbypos-!param.crop_box:limbfittedcentroids[0].limbypos+!param.crop_box],output='tritest_reg1.eps',/k,/display
; cgimage,startimage[limbfittedcentroids[1].limbxpos-!param.crop_box:limbfittedcentroids[1].limbxpos+!param.crop_box,limbfittedcentroids[1].limbypos-!param.crop_box:limbfittedcentroids[1].limbypos+!param.crop_box],output='tritest_reg2.eps',/k,/display
; cgimage,startimage[limbfittedcentroids[2].limbxpos-!param.crop_box:limbfittedcentroids[2].limbxpos+!param.crop_box,limbfittedcentroids[2].limbypos-!param.crop_box:limbfittedcentroids[2].limbypos+!param.crop_box],output='tritest_reg3.eps',/k,/display

; aa = startimage

; aa[*, limbfittedcentroids[0].limbypos -20]=255
; aa[*, limbfittedcentroids[0].limbypos -10]=255
; aa[*, limbfittedcentroids[0].limbypos]=255
; aa[*, limbfittedcentroids[0].limbypos +10]=255
; aa[*, limbfittedcentroids[0].limbypos +20]=255

; aa = aa[limbfittedcentroids[0].limbxpos-!param.crop_box:limbfittedcentroids[0].limbxpos+!param.crop_box,limbfittedcentroids[0].limbypos-!param.crop_box:limbfittedcentroids[0].limbypos+!param.crop_box]
; cgimage,aa,/k,/display,output='5chords.eps'

stop

end
```

After running `alpha.pro`, 3 images should be outputted:

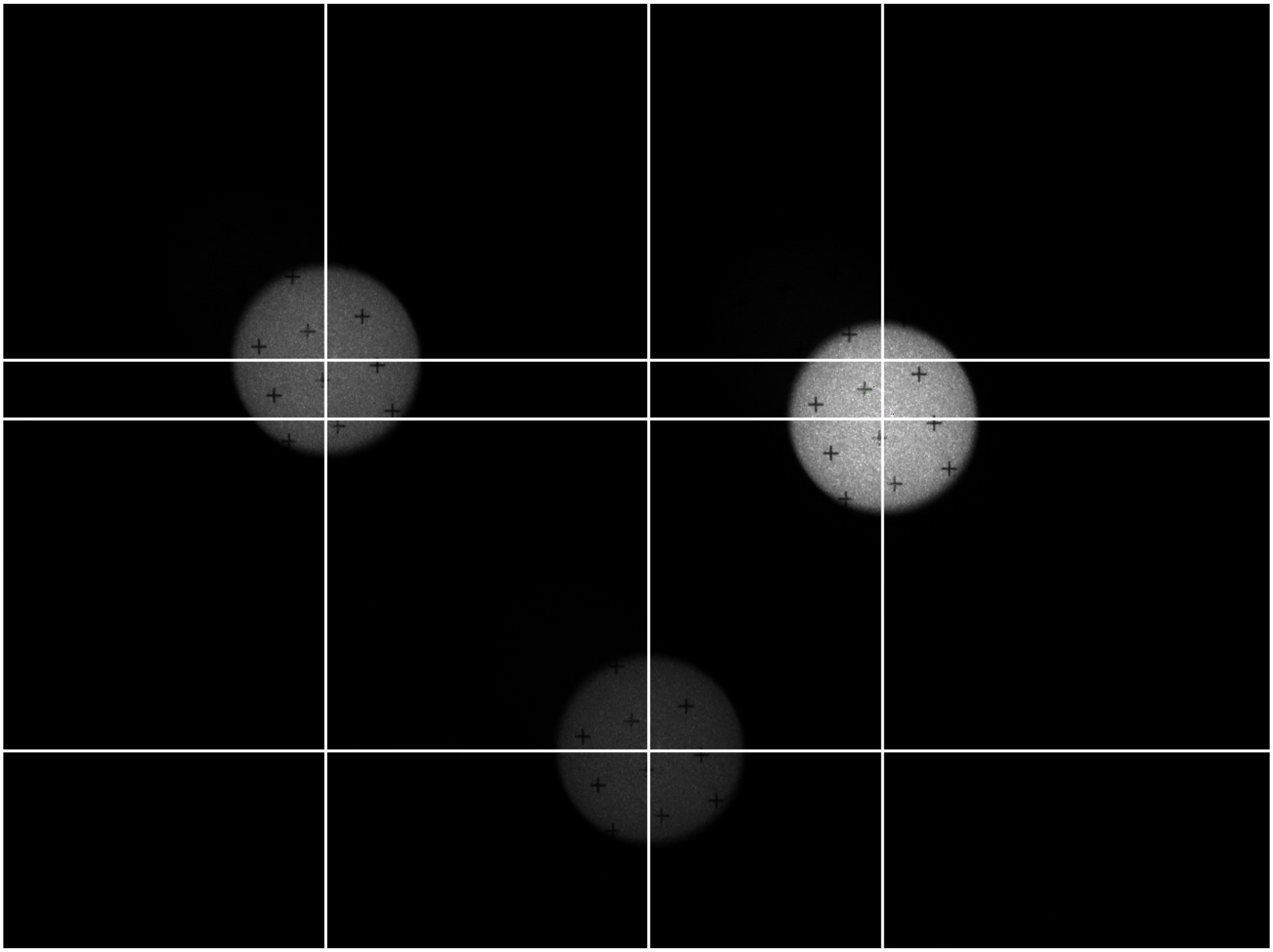
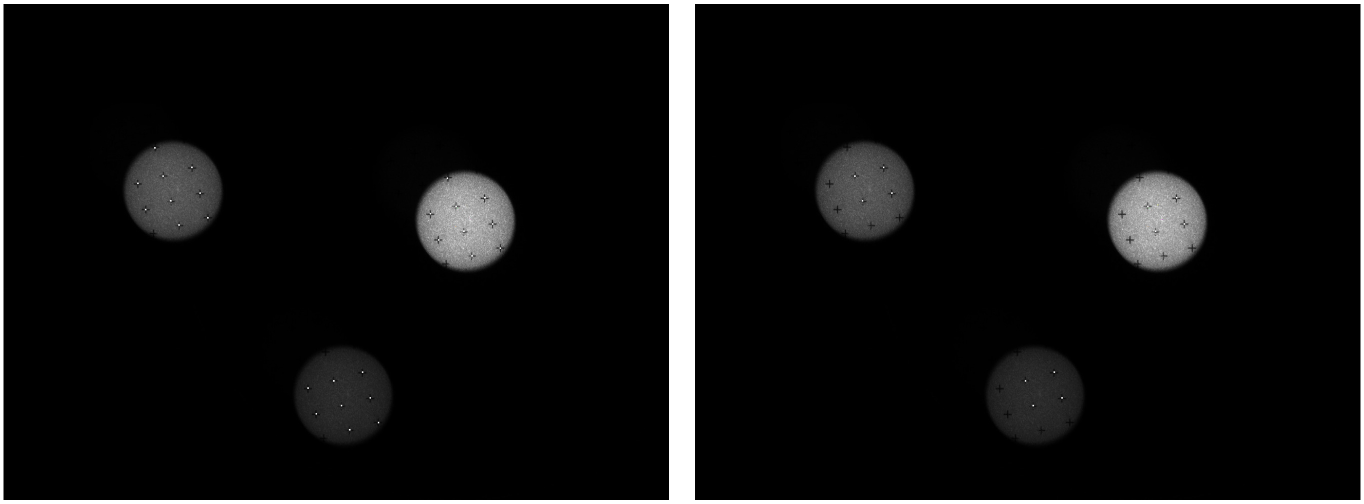


Figure 1: Starting image with center positions marked as white lines



(a) All good fiducials are marked in white

(b) Only the best 4 fiducials per sun have been marked

Figure 2