
Subject: Re: correlation of single pixels

Posted by [Klemen](#) on Fri, 09 Nov 2012 15:31:18 GMT

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Hi Max, my code compares one image with two other images and it is not really well documented :(But if you want some exaple here is a part of my old code that is more simple, without pyramids. I am not sure if it functions as it is, as I just tried to simplify it...
Cheers, Klemen

PRO cloud_height_correlation, file, modis_path, seviri_path

```
;Cross-corealtaion settings
d_search_area = 3L ;width of the half of the sqaure defining the search area
d_window = 3 ;width of the half of the search window (sqaure)
d_mask = d_search_area - d_window
max_pixels = 10L*(10L)^5 ;maximal number of pixels to be processed at the same time - avoid
to run out of memory
```

```
;Read path...
IF ~file THEN RETURN, "
lastSlash = STRPOS(file, '\', /REVERSE_SEARCH)
situation_num = strmid(file, lastSlash+1, 3)
path = strmid(file, 0, lastSlash+1)

;read MODIS and create valid mask to do the cross corelation
mo_file = FILE_SEARCH(path, situation_num + '2MO' + '*.tif', COUNT=ccc)
im_mo = float(READ_TIFF(mo_file))
S = REPLICATE(1, 2*d_search_area+1, 2*d_search_area+1)
mask = read_tiff(file)
mask = im_mo gt 0.
mask = erode(mask, S) * (im_mo gt 0)
in_size = size(mask)
indx_mask = where(mask eq 1, count_mask) ;compute ccr only for these pixels
if count_mask eq 0 then return, "
```

```
;Restore SEVIRI images
;file SEVIRI 1
s1_file = FILE_SEARCH(path, situation_num + '2S1' + '*.tif', COUNT=ccc)
im_s1 = float(read_tiff(s1_file)) ;+ 1.
s1_file = strmid(s1_file, lastSlash+1, lastSlash+50)
tmp = strlen(s1_file)
s1_file = strmid(s1_file, 6, tmp-10)
```

```
;Seach max correlation for all OK pixels
shift_s1_col = long(mask*0)
shift_s1_lin = shift_s1_col
```

```

cross_cor1 = make_array(in_size[1], in_size[2], value=-1.)

;prepare the indexes for the moving window
tmp = lindgen(in_size[1], in_size[2])
tmp = tmp - tmp[d_window,d_window]
indx_mw = tmp[0:2*d_window, 0:2*d_window]
tmp = !null
indx_mw = rebin(reform(indx_mw, 1, (2*d_window+1)^2), max_pixels, (2*d_window+1)^2)

;because of the memory issues do not run everything at once
for i=0L,count_mask-1,max_pixels do begin
  print, i
  if (i+max_pixels) gt (count_mask-1) then begin
    max_pixels = count_mask - i
    indx_mw = indx_mw[0:max_pixels-1, *]
  endif
  ;initialize partial results
  tmp_cor1 = make_array(max_pixels, value=-1.) ;partial output cross-correlation
  tmp_cor2 = tmp_cor1
  tmp_s1_col = make_array(max_pixels) ;partial output shift for SEVIRI 1 columns
  tmp_s1_lin = tmp_s1_col
  ;select indexes
  indx_i = indx_mask[i:i+max_pixels-1] ;indexes of pixels to be processed
  indx_all = rebin(indx_i, max_pixels, (2*d_window+1)^2) + indx_mw ;indexes of these pixels
and their vicinities
  ;prepare cross-correlation
  y = im_mo[indx_all] ;MODIS with its vicinity
  ym = total(y, 2) / (2*d_window+1)^2 ;average of MODIS within the pixel vicinity
  ym = rebin(ym, max_pixels, (2*d_window+1)^2)
  sum_y2 = total((y - ym)^2, 2)
  sign_col = 1
  for sh_lin=0,2 do BEGIN
    for sh_col_sign=0,5 do BEGIN
      sign_col = sign_col * (-1)
      sh_col = sh_col_sign / 2 * sign_col
      print, sh_lin, sh_col
      ;SEVIRI 1
      T = systime(1)
      im_shift = shift(im_s1, sh_col, sh_lin))
      x = im_shift[indx_all]
      xm = total(x, 2) / (2*d_window+1)^2 ;average of SEVIRI within the pixel vicinity
      xm = rebin(xm, max_pixels, (2*d_window+1)^2)
      T = systime(1)
      sum_x2 = total((x - xm)^2, 2)
      T = systime(1)
      sum_xy = total((x - xm)*(y-ym), 2)
      tmp = sum_xy / sqrt(sum_x2 * sum_y2) ;cross correlation
      indx_max = where(tmp gt tmp_cor1, count_max)

```

```
if count_max gt 0 then begin
  tmp_s1_col[indx_max] = sh_col
  tmp_s1_lin[indx_max] = sh_lin
  tmp_cor1[indx_max] = tmp[indx_max]
endif
```

```
endfor
```

```
;For documentation
```

```
write_tiff, path+situation_num+'shift_s1_col.tif', shift_s1_col, /float, COMPRESSION=1
write_tiff, path+situation_num+'shift_s1_lin.tif', shift_s1_lin, /float, COMPRESSION=1
write_tiff, path+situation_num+'cross_cor1.tif', cross_cor1, /float, COMPRESSION=1
write_tiff, path+situation_num+'shift_s2_col.tif', shift_s2_col, /float, COMPRESSION=1
write_tiff, path+situation_num+'shift_s2_lin.tif', shift_s2_lin, /float, COMPRESSION=1
write_tiff, path+situation_num+'cross_cor2.tif', cross_cor2, /float, COMPRESSION=1
```

```
END
```
