1_Align_RGB

June 20, 2018

This code uses the Python Open CV library to align red, green and blue band images in the format tif and combines them to produce an aligned RGB image in the format JPG. In addition, this code transfers the GPS information from the image in the reference band to the aligned RGB image.

Extensions asociated to each name file refers to a diferente band as is detailed below

- '*_1.tif' = Blue Band
- '*_2.tif' = Green Band
- '*_3.tif' = Red Band
- '*_4.tif' = Near Infrarred Band
- '*_5.tif' = Rededge Band

```
In [2]: ##Preamble
        %matplotlib inline
        import cv2
        import numpy as np
        import matplotlib.pyplot as plt
        import os
        import glob
        import traceback
        import sys
        from PIL import Image, ImageFilter
        import PIL
        import matplotlib.pyplot as plt

        import datetime
        now = datetime.datetime.now()

        print(now)
```

```
2018-05-29 17:53:44.373389
```

```
In [3]: ##Setting directory
        dir_set='/tidchile/collaborative/udd/ids/agro/AGRIFRUT_10-02/MICASENSE/0000SET/001'
        num_set=dir_set[-2:]
        ##Creating lists and listing blue band images
        filenames=glob.glob(dir_set+'/*.tif')
```

```
filenamesBLUE=[]
filenamesGREEN=[]
filenamesRED=[]
for i in range(len(filenames)):
    if filenames[i][83]=='1':
        filenamesBLUE.append(filenames[i])

filenamesBLUE.sort()
filenamesBLUE
```

```
Out[3]: ['/tidchile/collaborative/udd/ids/agro/AGRIFRUT_10-02/MICASENSE/0000SET/001/IMG_0000_1.t
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In [4]: ##Listing green band images
        filenamesGREEN=[]

        for i in range(len(filenames)):
            if filenames[i][83]=='2':
                filenamesGREEN.append(filenames[i])

        filenamesGREEN.sort()
        filenamesGREEN
```

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Out[4]: ['/tidchile/collaborative/udd/ids/agro/AGRIFRUT_10-02/MICASENSE/0000SET/001/IMG_0000_2.t
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In [5]: ##Listing red band images
        filenamesRED=[]

        for i in range(len(filenames)):
            if filenames[i][83]=='3':

                filenamesRED.append(filenames[i])

        filenamesRED.sort()
        filenamesRED
```

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Out[5]: ['/tidchile/collaborative/udd/ids/agro/AGRIFRUT_10-02/MICASENSE/0000SET/001/IMG_0000_3.t
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```

```
In [6]: ##Creating folder to save aligned images
        if not os.path.exists(dir_set+'_RGB_ALIGNED/'):
            os.makedirs(dir_set+'_RGB_ALIGNED/')
```

```
In [7]: ##Preparing to align images
        #Define motion model
        warp_mode = cv2.MOTION_TRANSLATION  #(Options: MOTION_EUCLIDEAN, MOTION_AFFINE and MOTIO
        # Set the warp matrix to identity.
        if warp_mode == cv2.MOTION_HOMOGRAPHY:
            warp_matrix = np.eye(3, 3, dtype=np.float32)
        else:
            warp_matrix = np.eye(2, 3, dtype=np.float32)
```

```
In [8]: ##Set the stopping criteria for the algorithm.
        criteria = (cv2.TERM_CRITERIA_EPS | cv2.TERM_CRITERIA_COUNT, 100000,  1e-5)
```

```
In [9]: dir_rgb=dir_set+'_RGB_ALIGNED/'

        print(dir_rgb)
```

```
/tidchile/collaborative/udd/ids/agro/AGRIFRUT_10-02/MICASENSE/0000SET/001_RGB_ALIGNED/
```

```
In [10]: ##Aligning images and saving as .JPG

         #Creating log file. List images which were not aligned
         log = open(dir_rgb + "error_align.log", "w")

         for i in range(len(filenamesRED)):
             try:
                 print("Processing: " + filenamesBLUE[i][74:82])
                 im_blue        =  cv2.imread(filenamesBLUE[i],0);
                 im_green       =  cv2.imread(filenamesGREEN[i],0);
                 im_red         =  cv2.imread(filenamesRED[i],0);


                 sz = im_blue.shape
                 print (sz)
                 height = int(sz[0])
                 width = sz[1]
```

```
            im_aligned = np.zeros((height,width,3), dtype=np.uint8 )
            im_aligned[:,:,2] = im_red[:,:]

            #Blue (Aligning Blue)
            (cc, warp_matrix) = cv2.findTransformECC (im_red[:,:], im_blue[:,:],warp_matrix

            im_aligned[:,:,0] = cv2.warpAffine(im_blue[:,:], warp_matrix, (width, height),

            #Green (Aligning Green)
            (cc, warp_matrix) = cv2.findTransformECC (im_red[:,:], im_green[:,:],warp_matri

            im_aligned[:,:,1] = cv2.warpAffine(im_green[:,:], warp_matrix, (width, height),
            cv2.imwrite(dir_rgb + filenamesBLUE[i][74:82]+'_RGB.JPG',im_aligned)
        except Exception:
            print("Error processing: " + filenamesBLUE[i][74:82])
            log.write("Error processing: " + filenamesBLUE[i][74:82] + '\n')
            continue
```

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Processing: IMG_0191
(960, 1280)
Processing: IMG_0192
(960, 1280)
Processing: IMG_0193
(960, 1280)
Processing: IMG_0194
(960, 1280)
Processing: IMG_0195
(960, 1280)
Processing: IMG_0196
(960, 1280)
Processing: IMG_0197
(960, 1280)
Processing: IMG_0198
(960, 1280)
Processing: IMG_0199
(960, 1280)
```

```
In [11]: !ls
```

```
000                      005               010_RGB_ALIGNED
000_IR-REDGE_ALIGNED  005_RGB_ALIGNED  Align_RGB_1.ipynb
000_RGB_ALIGNED       006               Align_RGB_2.ipynb
001                      006_RGB_ALIGNED  Align_RGB_3_NIRR.ipynb
001_RGB_ALIGNED       007               Align_RGB_4_NIRRE.ipynb
002                      007_RGB_ALIGNED  IMG_0001_1.tif
002_RGB_ALIGNED       008               Untitled.ipynb
003                      008_RGB_ALIGNED  Untitled1.ipynb
003_RGB_ALIGNED       009               diag.dat
```

```
004                      009_RGB_ALIGNED  paramlog.dat
004_RGB_ALIGNED       010
```

```
In [12]: ##Copy information from red images (*_3.tif) with Exiftool. I aligning using as a refer
         #If you align using another band as a reference you have to use the images with
         #the correct extension.
```

```
In [ ]: %%bash -s "$dir_set" "$dir_rgb"

        dir=$(pwd)

        dir_set=$1/
        dir_rgb=$2

        echo $dir_rgb

        ls $dir_rgb*.JPG | xargs -n 1 basename > ${dir_rgb}rgb_files.txt

        for f in `cat ${dir_rgb}rgb_files.txt`;
        do
        aa=$dir_set${f:0:8}_3.tif
        bb=$dir_rgb$f

        echo $aa
        echo $bb
        exiftool —overwrite_original_in_place -r -tagsFromFile $aa -gps:all -ExifIFD:all $bb;
        done
```

```
In [14]: now = datetime.datetime.now()

         print(now)
```

```
2018-05-29 18:29:54.182722
```