# Agisoft_rotation_distortion

March 19, 2020

[ ]:
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import numpy as np
import math

def colinearite(F,S,R,M):
    RMS = R@(M-S)
    l = F[2]/RMS[2]
    m = F - l * RMS
    return m

def correct_disto_agisoft(x,y,f,cx,cy,k1,k2,k3,k4,p1,p2,p3,p4,b1,b2,w,h):
    x = x / f
    y = y / f
    r2 = pow(x,2)+pow(y,2)
    xp = x*(1
            + k1*r2
            + k2*pow(r2,2)
            + k3*pow(r2,3)
            + k4*pow(r2,4))
            + (p1*(r2+2*pow(x,2))+2*p2*x*y)*(1+p3*r2+p4*pow(r2,2))
    yp = y*(1
            + k1*r2
            + k2*pow(r2,2)
            + k3*pow(r2,3)
            + k4*pow(r2,4))
            + (p2*(r2+2*pow(y,2))+2*p1*x*y)*(1+p3*r2+p4*pow(r2,2))
    u = w/2+cx-xp*f-xp*b1-yp*b2
    v = h/2+cy+yp*f
    return u,v

def readOPKFile(filename):
    # Exported Cameras from Agisoft format OPK
    # PhotoID, X, Y, Z, Omega, Phi, Kappa, r11, r12, r13, r21, r22, r23, r31,␣
 ↪r32, r33
    out = {}
    with open(filename) as f:
        for l in f:
            if l.startswith("#"):
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                continue
            l = l.split()
            x,y,z = float(l[1]),float(l[2]),float(l[3])
            S = np.asarray([[x,y,z]]).T
            Rtemp = [float(l[i]) for i in range(7,16)]
            R = np.array([
                [Rtemp[0], Rtemp[1], Rtemp[2]],
                [Rtemp[3], Rtemp[4], Rtemp[5]],
                [Rtemp[6], Rtemp[7], Rtemp[8]],
            ])
            out[l[0]] = [S,R]
    return out
```

[ ]:
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# camera SODA
cx,cy,f = 3.82306,-2.97748,4403.85364
F = np.array([[0,0,-f]]).T
k1,k2,k3,k4 =  0.0357623, -0.225367,0.335679,0
b1,b2 = 0,0
p1,p2,p3,p4 =  0.000326625, -0.000662997, 0, 0
w,h = 5472,3648

# image 43
x,y,z = 2540437.247, 1181187.714, 584.238
S = np.asarray([[x,y,z]]).T

# image 43
R = np.array([
    [ 0.5131,-0.8564,0.05711],
    [ 0.8359, 0.5137,0.1933],
    [-0.1949,-0.0514,0.9795],
])


M = np.array([[2540472.74,1181180.94,448.22]]).T
m = colinearite(F,S,R,M)
x,y = correct_disto_agisoft(
        m[0][0],m[1][0],
        f,cx,cy,k1,k2,k3,k4,p1,p2,p3,p4,b1,b2,w,h)
```