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CSE

Homework 1

CSE 803
October 4, 2021

Code in src/HW1.ipynb

Problem 1

(a) See src/cube.gif

(b) 3D rotation matrices are not commutative.

(a) X then Y (b) Y then X

Figure 1: two transformations

(c) First, I rotate the cube around Y for $\pi/4$. Then, I rotate the cube around X for $\arcsin(1/\sqrt{3})$.

Explanation: According to the Hint, to project the cube's body diagonal into the point, we need to rotate it and let it align with z axis. The angle between the body diagonal and z axis is $\arcsin(1/\sqrt{3})$.

(d) Change the code to fit into the scenario where the focal length is infinite.

See src/dolly_zoom.py

(a) projection of the body diagonal (b) infinite focal length

Figure 2: (c) and (d)

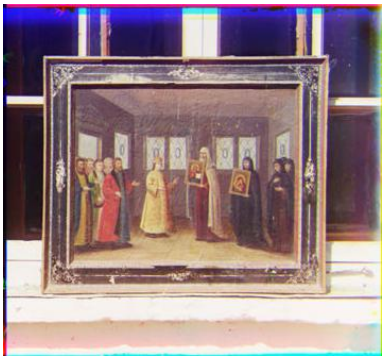
Problem 2

(a) A wonky picture:

Figure 3: wonky picture

(b) Use normalized cross correlation as the similarity metric. The first channel has (0,0) offset. The subtitle includes the offsets for the second and the third channel.

(a) (-4,-1),(-3,-1)



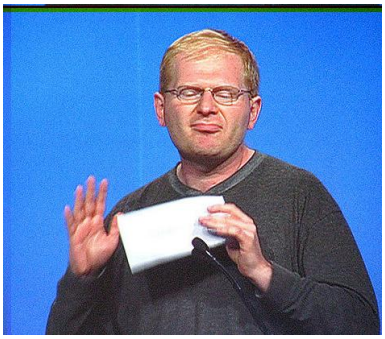
(b) (-1,-1),(-1,-4)

(c) (-2,-1),(-7,0)

(d) (0,0),(1,-1)

(e) (1,0),(0,-1)

(f) (0,-1),(5,-1)



(g) (5,10),(10,5)

Figure 4: aligned

(c) The subtitle includes the offsets for the second and the third channel of the first stage, the second stage and the overall.

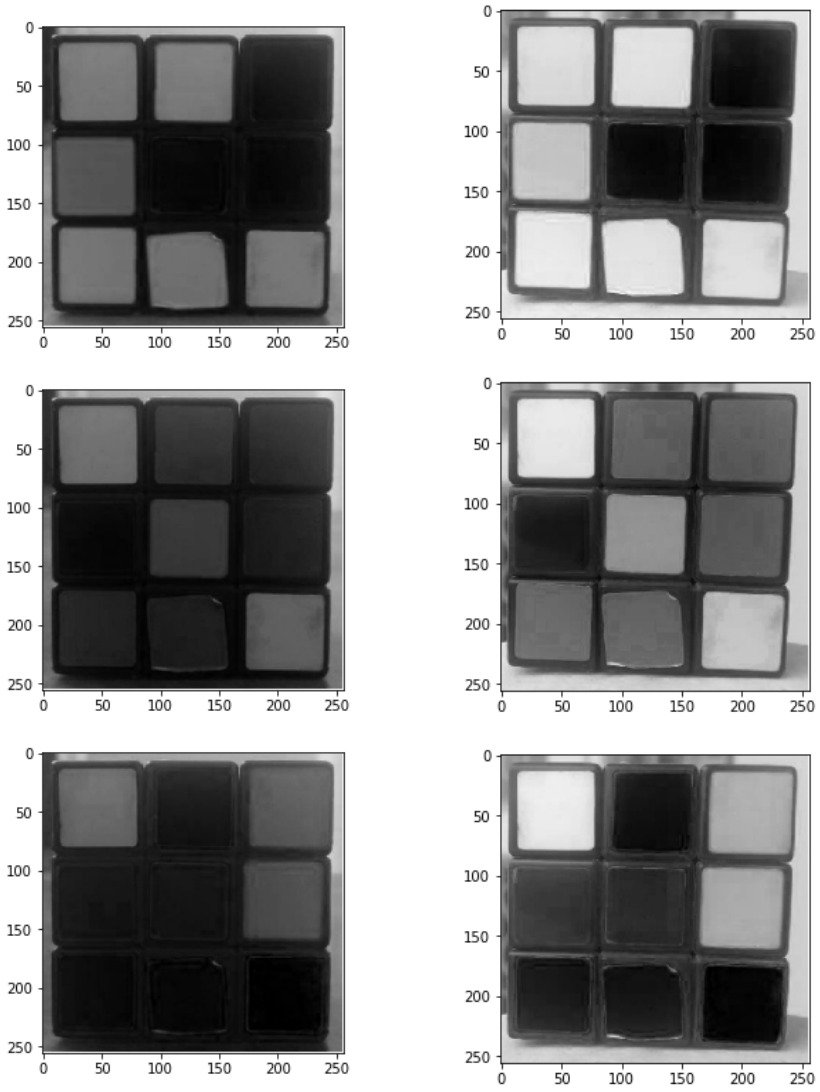
(a) (2,3),(4,1) then (1,0),(0,-1), overall (5,6),(8,1)

(b) (2,11),(9,6) then (0,0),(0,0), overall (4,22),(18,12)

Figure 5: Pyramid

Problem 3

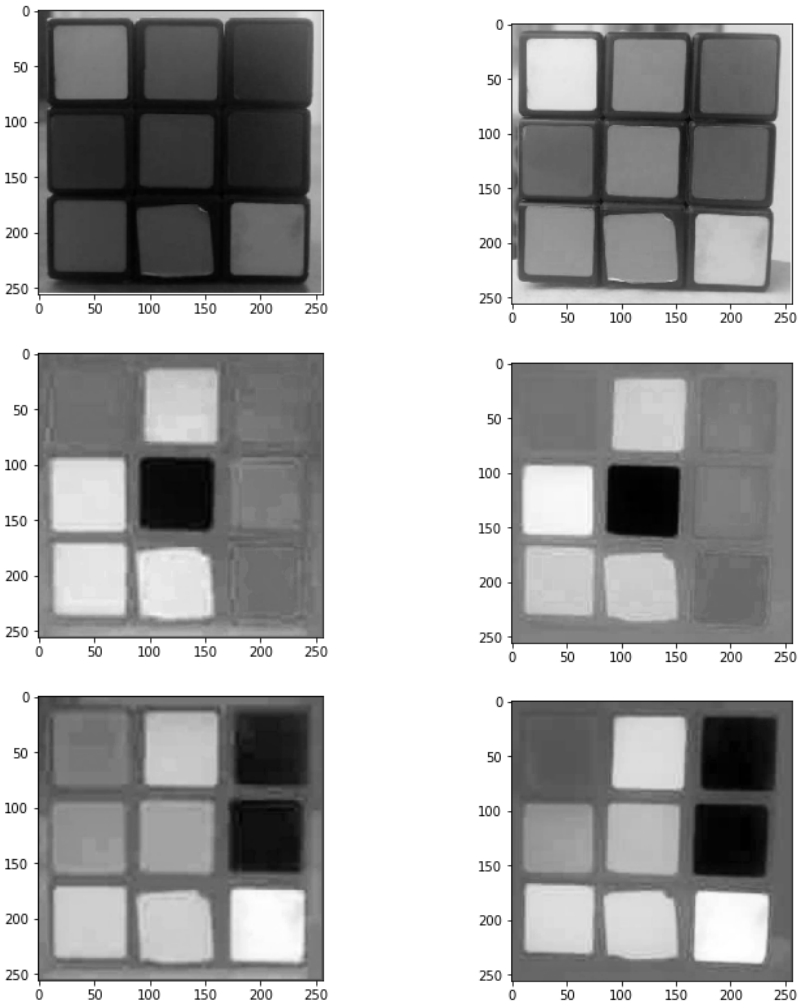
(a) RGB:



(a) Indoor (b) Outdoor

Figure 6: RGB

LAB:



(a) Indoor (b) Outdoor

Figure 7: LAB

(b) From the channel L we can distinguish two pictures' lightness easily.

(c) See src/im1.jpg, im2.jpg and info.txt