

CS4186 Assignment 2

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PART-A: GRAB CUT ALGORITHM

Procedures:

1. First, I tried GRAB CUT algorithm in opencv with user specified rectangular. However, the performance is poor, because some of the background colours are similar to the foreground or some of the foreground colours are very different from others. The results are below.

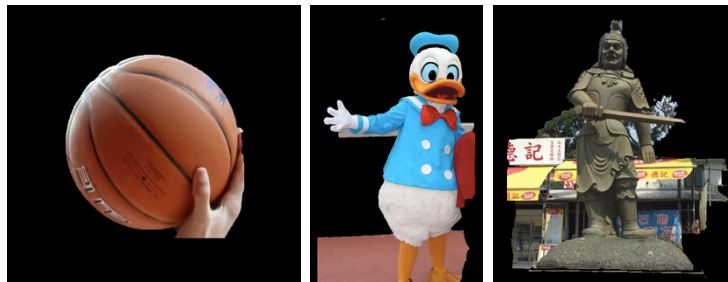


Figure 1: GRAB CUT algorithm without manually labelled masks

2. As you could see, the result is not satisfactory, the contours of three objects are not clear. Next, I tried GRAB CUT algorithm with manually labelled masks, which specifies the sure background and sure foreground, the performance got improved. The results are as follows.

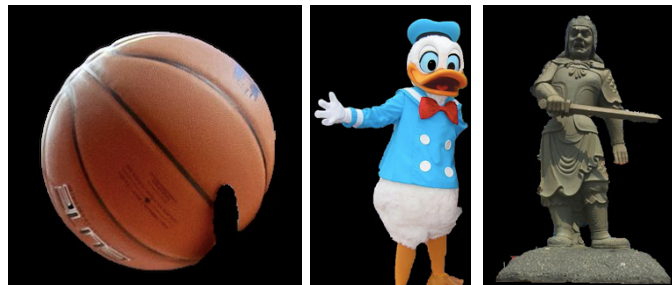


Figure 2: GRAB CUT algorithm with manually labelled masks

PART-B: RELATIVE HEIGHT (3D) ESTIMATION

Procedures:

1. I used SIFT to detect corners in both images. Here, I applied BFMatcher() together with Lowe's ratio test to select good matches. I set a relative high threshold, 0.9, which allows more corner points passed to the next phase.
2. Given the set of corner points in two images, I calculated Fundamental Matrix by findFundamentalMat() method built in opencv. Only inlier points are selected and passed to the next phase.

- Given the fundamental matrix, I was able to draw the epipolar lines for each corner point. Here show the results.

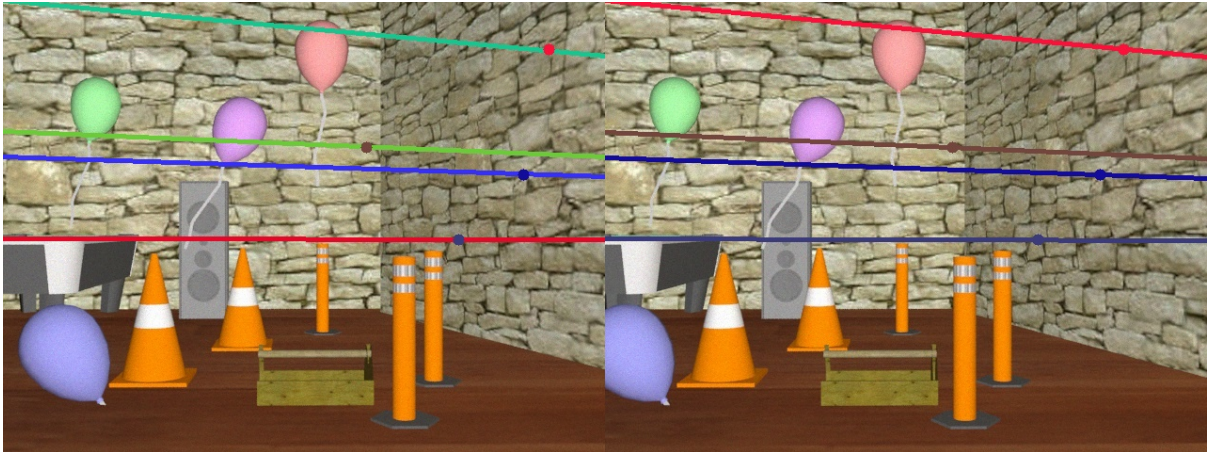


Figure 3: Epipolar lines for 1_a.jpg and 1_b.jpg

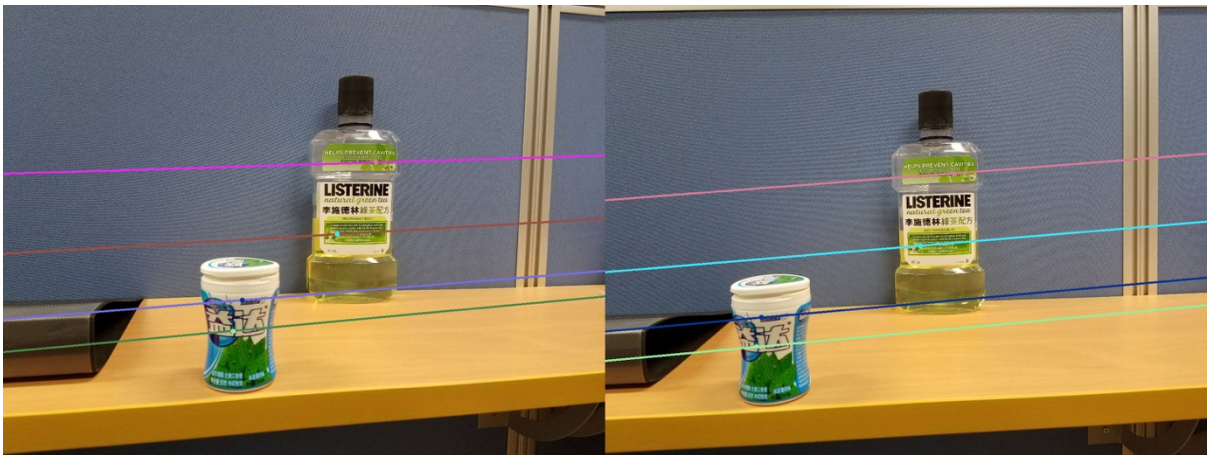


Figure 4: Epipolar lines for 2_a.jpg and 2_b.jpg

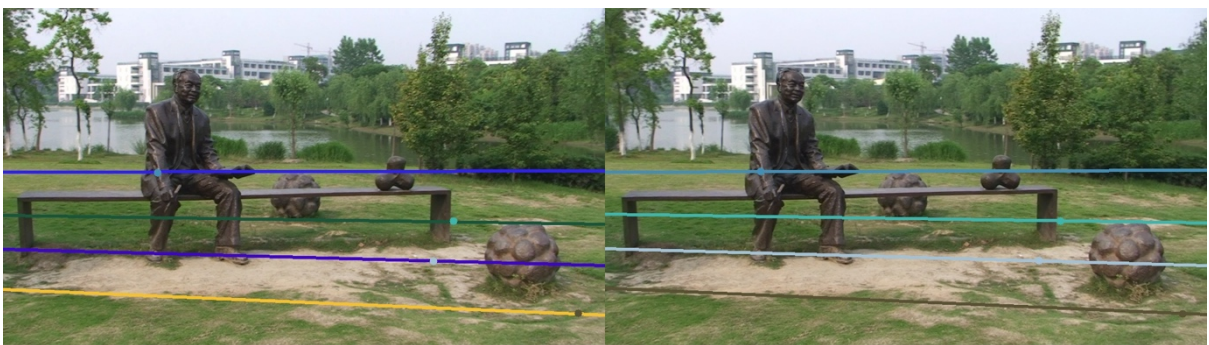


Figure 5: Epipolar lines for 3_a.jpg and 3_b.jpg

- Next, I was able to calculate the rectified images using the Fundamental matrix and compute the disparity map between each two rectified images. For 2_a and 2_b, I noticed the performance was quite poor compared to the other two pairs, I believe the reason would be the textureless background and desks.

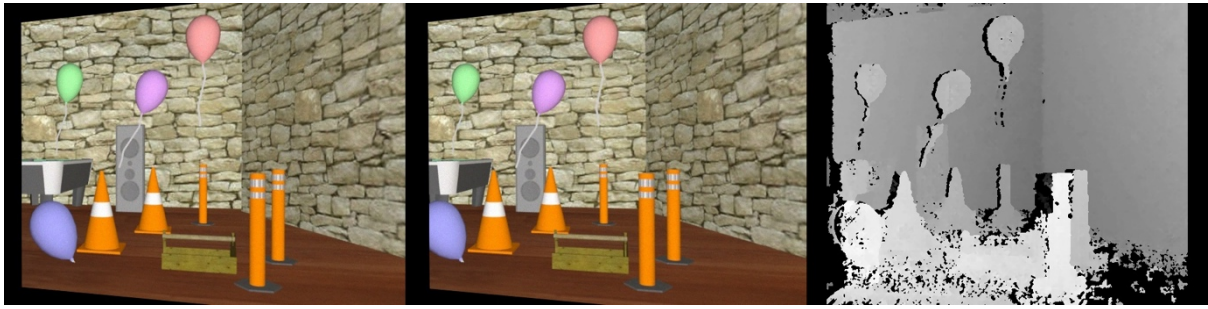


Figure 6: Rectified 1_a, 1_b and their disparity map accordingly



Figure 7: Rectified 2_a, 2_b and their disparity map accordingly



Figure 8: Rectified 3_a, 3_b and their disparity map accordingly

5. For relative height estimation problem, I utilized the GRAB CUT algorithm in PART-A to find out the contours of each object in the rectified images. Following are the results after GRAB CUT algorithm.

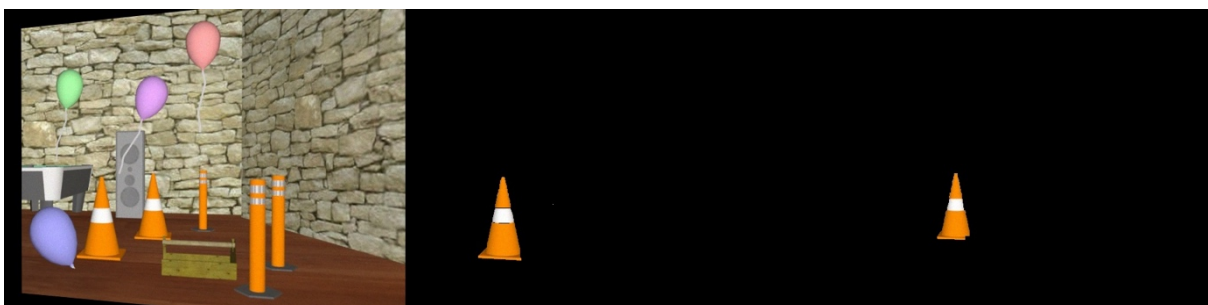


Figure 9: Rectified 1_a, and contours of two traffic cones accordingly



Figure 10: Rectified 2_a, and contours of two bottles accordingly



Figure 11: Rectified 3_a, and contours of the statue and the stone accordingly

6. After getting the contours (mask) of each object, I was capable to apply the mask to the disparity map. Then I could find out the disparity value of each object. Here, I used median of all none-zero values, because it is robust against noises. After measuring the actual pixel height of two objects and computing the ratio between two disparity values, I was able to find out the relative height of each pairs.

Relative Height of two traffic cones: **1.0146**

Relative Height of two bottles: **0.3767**

Relative Height of the statue and the right stone: **2.4182**