Computer Vision and Pattern Recognition
Project 3

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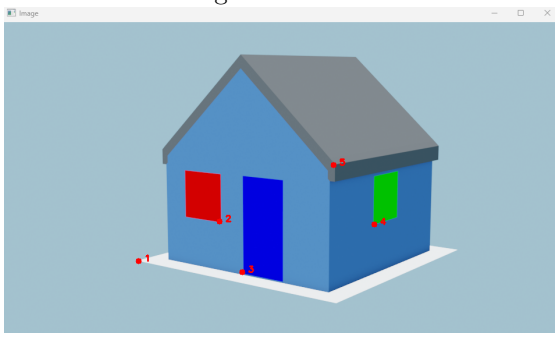
1 Description of Solution

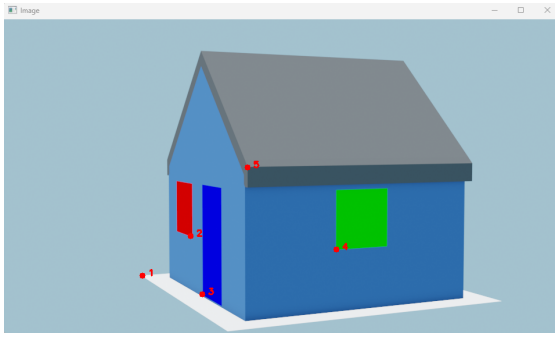
1.1 Task 1

We manually read the points off the image by selecting the points we wanted using mouseclick event. The red circles were put on the selected points and the coordinates of the selected points were put in a list.

These are the images below and the cordinates of each image,



```
[(234, 410), (373, 342), (412, 429), (639, 347), (569, 245)]
```



```
[(239, 440), (322, 372), (342, 472), (573, 395), (420, 254)]
```

We then followed the steps in the 8 point algorithm, which are specified below to make the fundamental matrix using the coordinates of the two images.

0. Normalized points
1. Constructed the matrix A
2. Found the SVD
3. Entries of F are the elements of column of V corresponding to the least singular value
4. Did a rank of 2 for the F matrix

Our F is shown below in the image.

```
array([[-0.19525566, -0.01652633,  0.19525568, -0.24357238, -0.13579939,
         0.69238532, -0.29427298, -0.09157725,  0.52089149],
       [-0.47427114, -0.04014204,  0.4742712 ,  0.15909202,  0.1009542 ,
        -0.53850974, -0.4127939 ,  0.01418033,  0.22897092],
       [ 0.04723912,  0.00399829, -0.04723912, -0.87537318,  0.17988354,
        -0.17601275, -0.3049188 ,  0.11282357, -0.24535592],
       [-0.24903829, -0.02107846,  0.24903832,  0.16572596,  0.58031159,
         0.40824831,  0.03662577,  0.42209634, -0.40634402],
       [-0.23575458, -0.01995413,  0.23575461, -0.32810286, -0.03629649,
        -0.1332947 ,  0.76760081,  0.26761108,  0.3176134 ],
       [ 0.58495497, -0.33010161,  0.71309176, -0.02290662, -0.09512337,
         0.02798015,  0.03447781, -0.10824795, -0.13076071],
       [-0.01625453,  0.82302906,  0.30066375, -0.05949998,  0.07231093,
         0.03999037,  0.12338372, -0.42521972, -0.15986423],
       [ 0.43525109,  0.45251007,  0.02188731,  0.09915992, -0.04054426,
        -0.07483013, -0.19715628,  0.67258724,  0.31143508],
       [-0.29194219,  0.07840779,  0.13316379, -0.00835379, -0.76485852,
         0.08493249, -0.06475971,  0.28982639, -0.45869855]])
```

After the 2 rank constraint was applied to f.

```
array([ 1.12667631,  0.20330671,  1.49869073,  0.78010913, -1.56176595,
       -1.20458344, -0.9304275 , -0.27880549, -0.03256889])
```

2 Task 2

We used the calculations from task one and applied the linear triangulation method using the DLT as stated in the book. The below image shows the p and p prime that we got

```
P
[[1. 0. 0. 0. 0. 0. 0. 0. 0.]
 [0. 1. 0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 1. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 1. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 1. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 1. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 1. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0. 1. 0.]
 [0. 0. 0. 0. 0. 0. 0. 0. 1.]]


P prime
[[-0.        ]
 [-0.52740158]
 [-0.        ]
 [ 0.16572182]
 [ 0.01255717]
 [-0.3831043 ]
 [-0.50504132]
 [ 0.0279783 ]
 [ 0.45051671]]
```

3 Task 3

We used the coordinates from the file coords.tex and our own cordinates got from p and p prime to try to get the matching coordinates.

4 Task 4

There were difficulties with the above parts, so this section is not complete.