

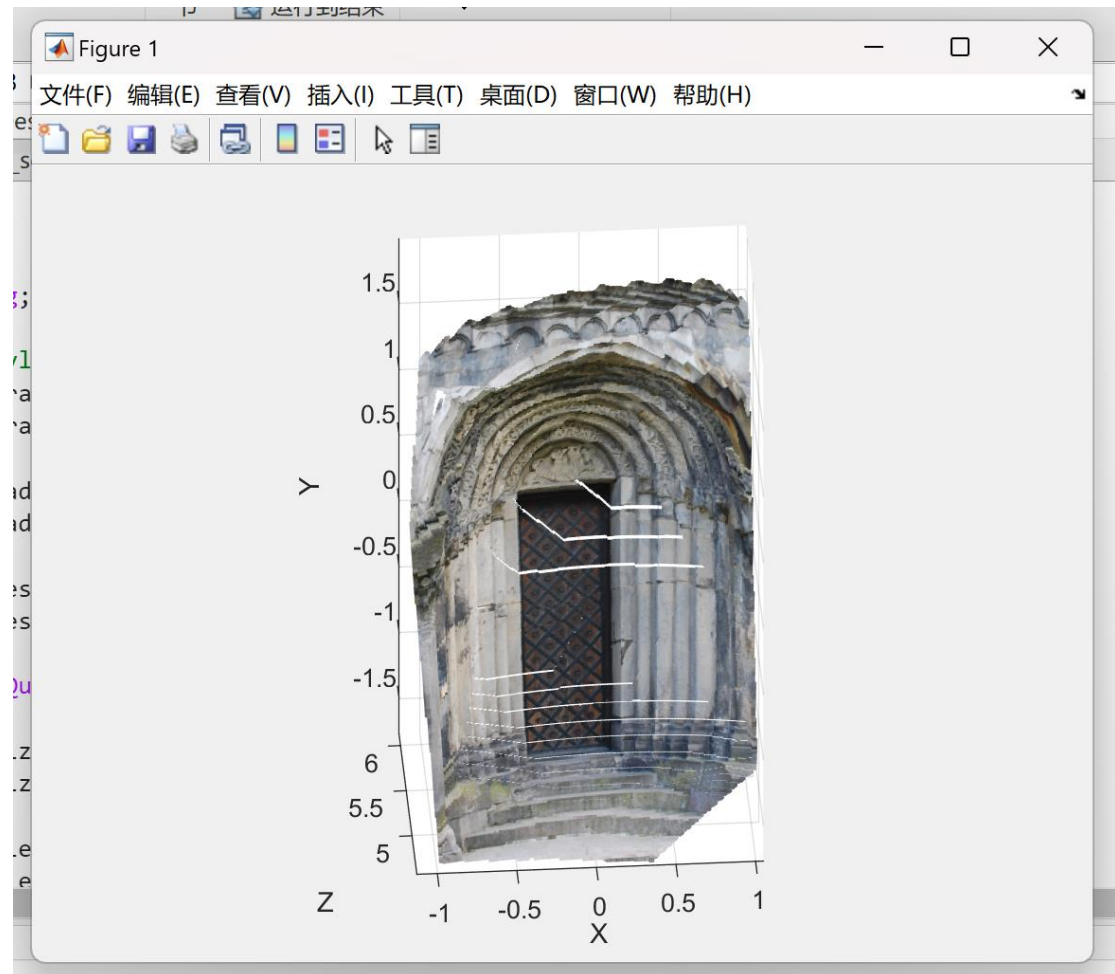
ENGN 1610/2605 Image Understanding

Lab #8 3D Reconstruction

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Problem 1. Scene Reconstruction

The code for this result is in "P1.m" file.



Problem 2. Answer the Question

Take a look at the `Densification.m` function file. How does the function work to make dense correspondences? Also, briefly explain the possible causes of the gaps of regions obtained in the 3D reconstruction.

1. Interpolate first, according to correspondence. Reverse interpolation is performed

at the same time. This creates a dense correspondence. A bidirectional consistency check and a reprojection error check were then performed, returning only the inlier points of dense correspondences.

2. If there are no correspondences or very few correspondences for certain regions in the images, those regions won't be included in the 3D reconstruction. Or because of the outlier, the outlier in the feature correspondence may cause the interpolation to be incorrect or inconsistent, resulting in gaps in the reconstruction.

Problem 3. Triangulation by Non-linear Optimization

The code for this result is in "P3.m" file.

```

命令窗口

Iteration   Func-count   Resnorm      First-order      Lambda      Norm of
           0           6       9.58789e+08    optimality      step
           1          12       5.64546       7.36e+04      0.001      1.00003
           2          18       1.39951e-23    1.16e-07      0.0001     7.67456e-05

找到局部最小值。

优化已完成，因为梯度大小小于
函数容差的 1e-4 倍。

<停止条件详细信息>
Reprojection errors (the mid-point triangulation method):2.2678
Reprojection errors (the non-linear optimization method):7.6767e-05
fx>>

```

In what order of magnitude is the reprojection error reduced after the optimization?

```

>> log10(errors_m / errors_o)

ans =

    4.470431363471468

fx>>

```

So, the reprojection error is reduced by approximately 4 orders of magnitude after the optimization.