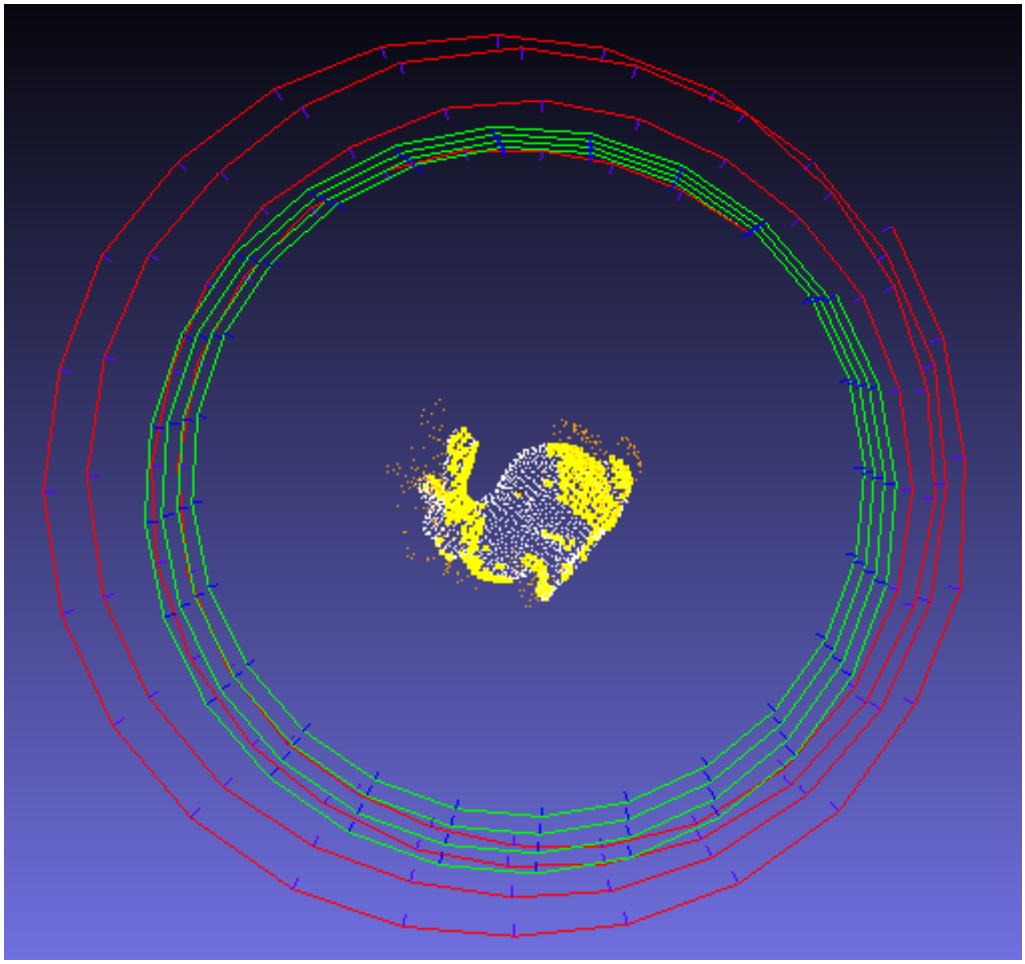
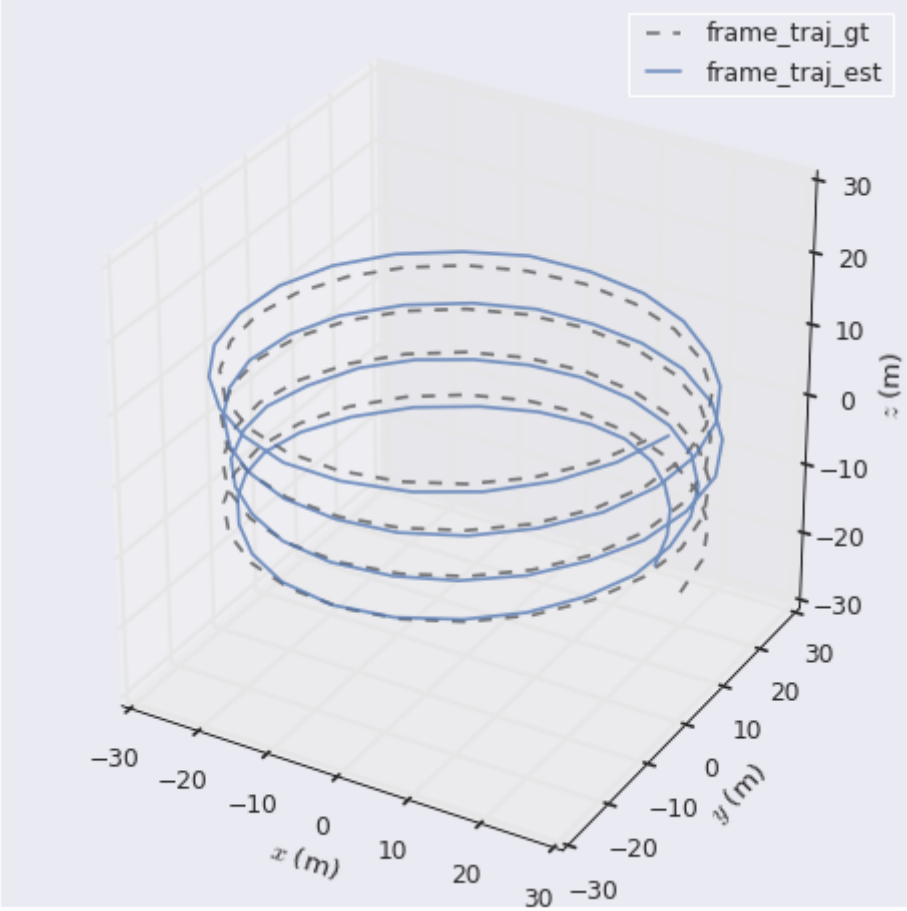
1. Task 1 : 直接三角化



```
 evo_traj tum frame_traj_est.txt --ref=frame_traj_gt.txt -p --plot_mode xyz  --
align --correct_scale
```




```
evo_ape tum frame_traj_est.txt frame_traj_gt.txt  -va --plot --plot_mode xyz --
save_results ape.zip
       max  7.988524
      mean  4.854794
    median  4.779704
       min  1.140661
      rmse  5.119821
       sse  2516.406403
       std  1.625897
```

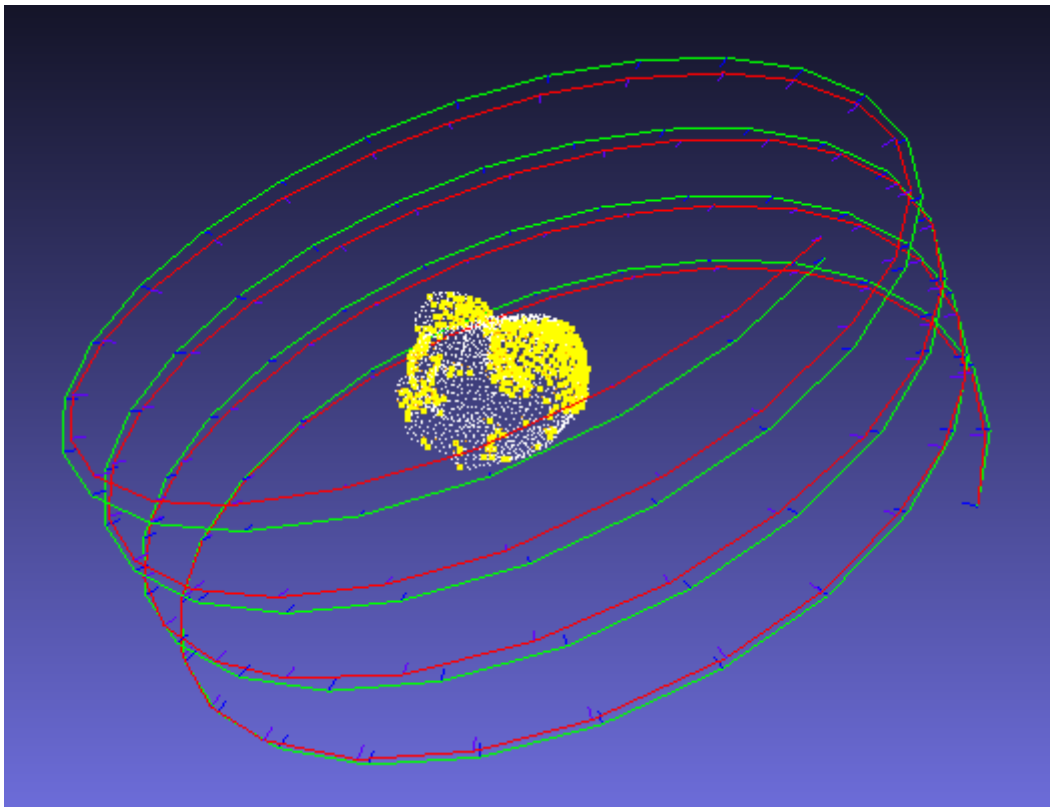
```
 evo_rpe tum frame_traj_est.txt frame_traj_gt.txt  -va --plot --plot_mode xyz --
save_results rpe.zip

       max  2.503827
      mean  1.380783
    median  1.401187
       min  0.345557
      rmse  1.479378
       sse  207.913208
       std  0.531035
```

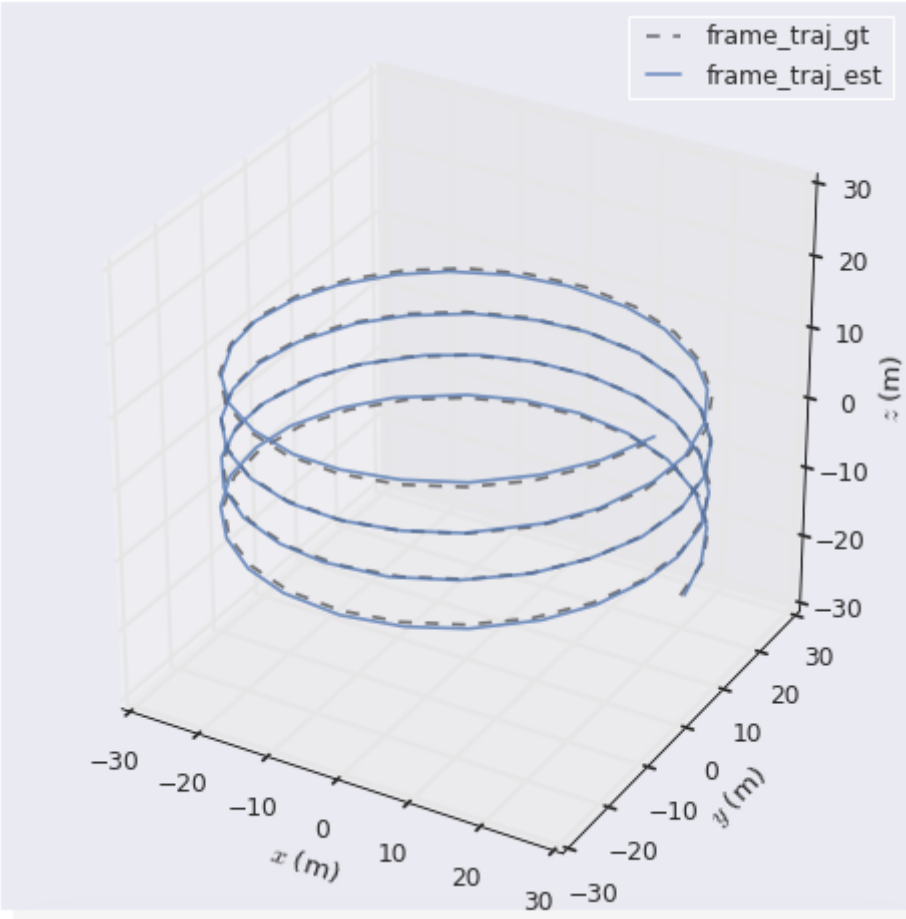
```
evo_res ape.zip -p --save_table table.csv

                   max     mean  median      min     rmse      sse     std
frame_traj_gt  7.98852  4.85479  4.7797  1.14066  5.11982  2516.41  1.6259
```

2. task2： 三角化 + BA



```
 evo_traj tum frame_traj_est.txt --ref=frame_traj_gt.txt -p --plot_mode xyz  --
align --correct_scale
```

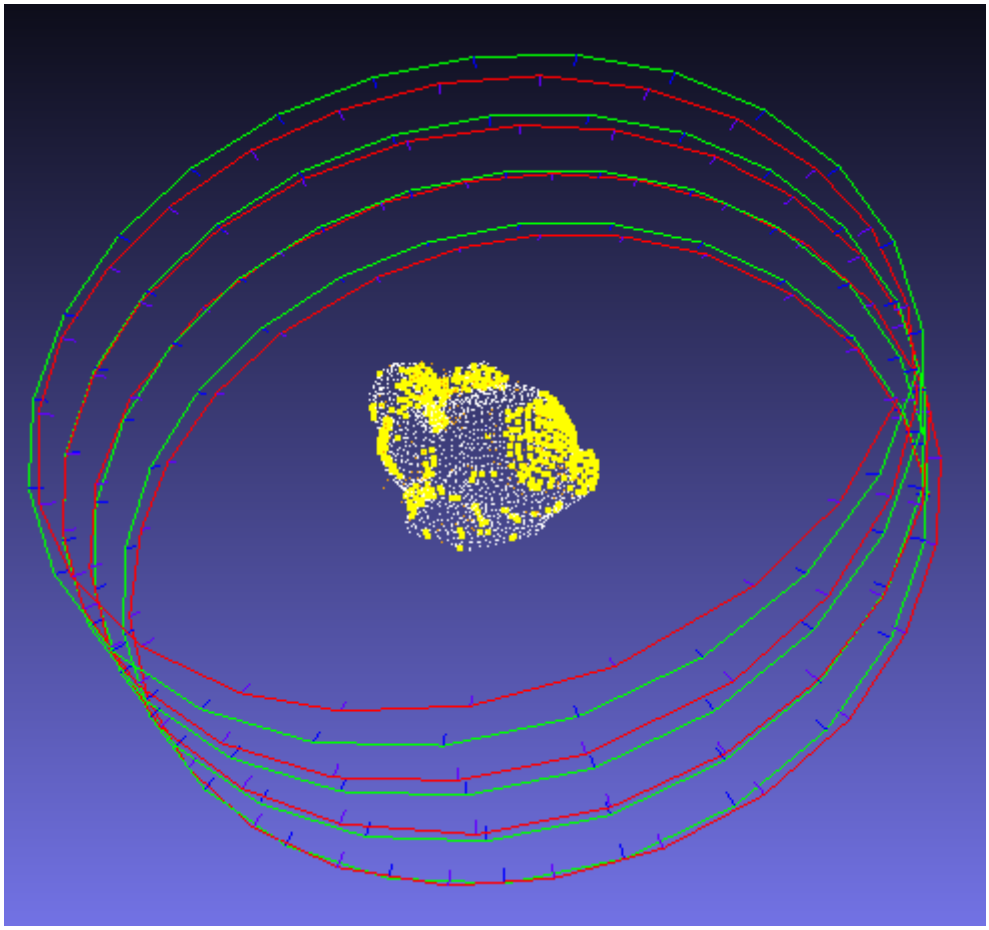


```
evo_ape tum frame_traj_est.txt frame_traj_gt.txt  -va --plot --plot_mode xyz --
save_results ape.zip
       max  2.830356
      mean  1.088119
    median  1.117042
       min  0.046486
      rmse  1.222984
       sse  143.586343
       std  0.558291
```

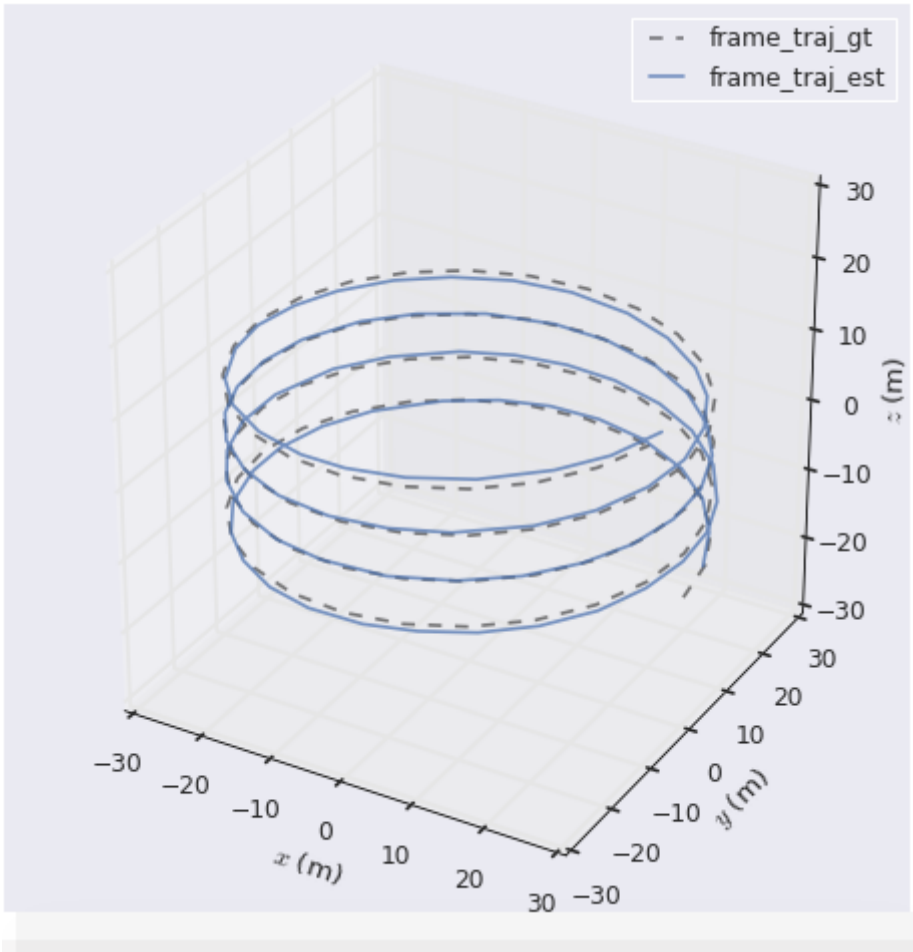
```
 evo_rpe tum frame_traj_est.txt frame_traj_gt.txt  -va --plot --plot_mode xyz --
save_results rpe.zip
       max  1.798316
      mean  0.498460
    median  0.380933
       min  0.027438
      rmse  0.624018
       sse  36.992823
       std  0.375414
```

```
evo_res ape.zip -p --save_table table.csv
                   max     mean   median        min     rmse      sse      std
frame_traj_gt  2.83036  1.08812  1.11704  0.0464858  1.22298  143.586  0.558291
```

3. task3: 三角化 + BA + outlier



```
 evo_traj tum frame_traj_est.txt --ref=frame_traj_gt.txt -p --plot_mode xyz  --
align --correct_scale
```



```
evo_ape tum frame_traj_est.txt frame_traj_gt.txt  -va --plot --plot_mode xyz --
save_results ape.zip
       max  6.969077
      mean  2.746384
    median  2.443365
       min  0.281874
      rmse  3.175060
       sse  967.776786
       std  1.593231
```

```
 evo_rpe tum frame_traj_est.txt frame_traj_gt.txt  -va --plot --plot_mode xyz --
save_results rpe.zip
       max  2.184738
      mean  0.556210
    median  0.509827
       min  0.029194
      rmse  0.698139
       sse  46.302846
       std  0.421934
```

```
evo_res ape.zip -p --save_table table.csv
                  max     mean   median       min     rmse      sse      std
frame_traj_gt  6.96908  2.74638  2.44336  0.281874  3.17506  967.777  1.59323
```

4 综合分析

evo_ape(计算绝对位姿误差)

	1	2	3
max	7.988524	2.830356	6.969077
mean	4.854794	1.088119	2.746384
median	4.779704	1.117042	2.443365
min	1.140661	0.046486	0.281874
rmse	5.119821	1.222984	3.17506
sse	2516.406403	143.586343	967.776786
std	1.625897	0.558291	1.593231

evo_rpe(计算相对位姿误差)

max	**2.503827**	**1.798316**	**2.184738**
mean	1.380783	0.49846	0.55621
median	1.401187	0.380933	0.509827
min	0.345557	0.027438	0.029194
rmse	1.479378	0.624018	0.698139
sse	207.913208	36.992823	46.302846
std	0.531035	0.375414	0.421934

**evo_res(结果比较)

max mean median min rmse sse std frame_traj_gt 7.98852 4.85479 4.7797 1.14066 5.11982 2516.41 1.6259 frame_traj_gt **2.83036 1.08812 1.11704 0.0464858 1.22298** 143.586 **0.558291** frame_traj_gt 6.96908 2.74638 2.44336 0.281874 3.17506 967.777 1.59323

** 时间消耗

-	**1**	**2**	**3**
时间(clock())	3,539,027	25,676,731	20,456,998

总体效果，任务一计算的vo有较大的累积偏差，任务二加入ba的优化的效果比较好，能有效减少偏差，但相应的计算耗时接近10倍增加，任务三加入outlier的方式， vo优化效果相比任务二效果变差了一点，整体上强于任务一，因为outlier判断减少了计算点数，耗时比任务二少。

注意事项：

eigen对数据类型敏感，double与float需要显示转换； ba优化中的相机节点的pose需要是Tcw; 两帧BA优化中需要将第一帧fixed; 注意eigen与cv::mat间的转换， 坐标系的转换