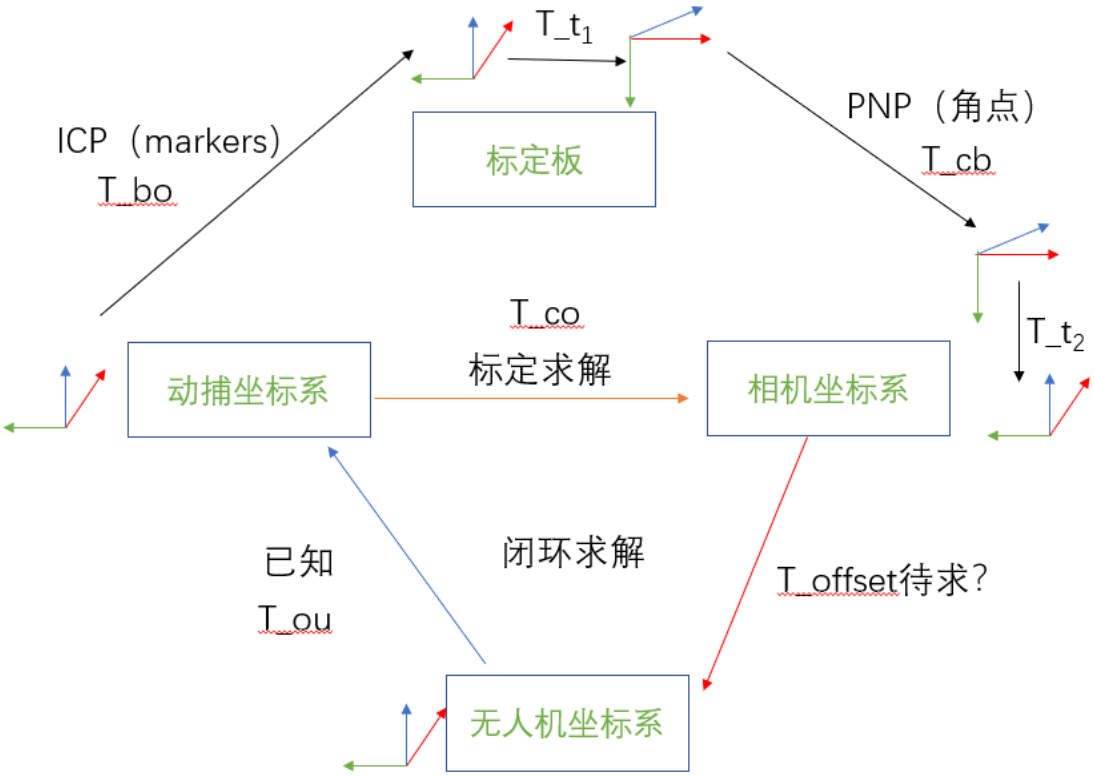
标定实验结构

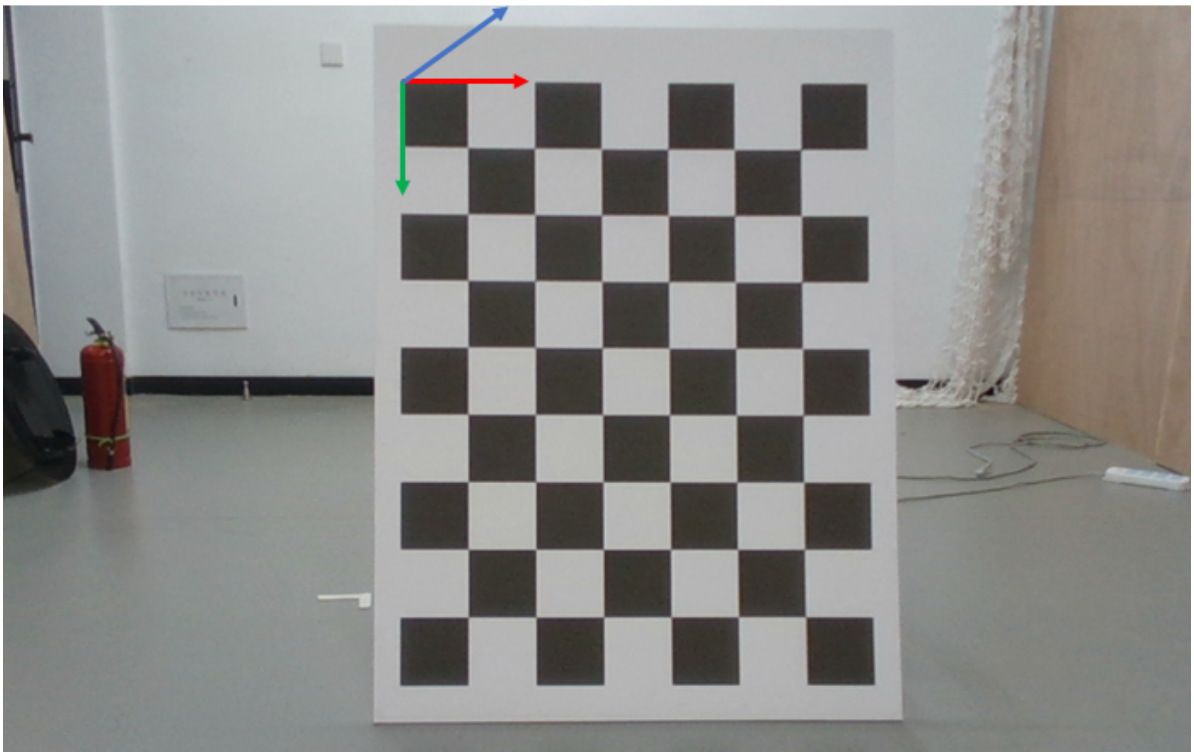


$$T\_offset = (Tco\ T\_ou)^{-1} = (T\_t_2\ T\_cb\ T\_t_1\ Tbo\ T\_ou)^{-1}$$

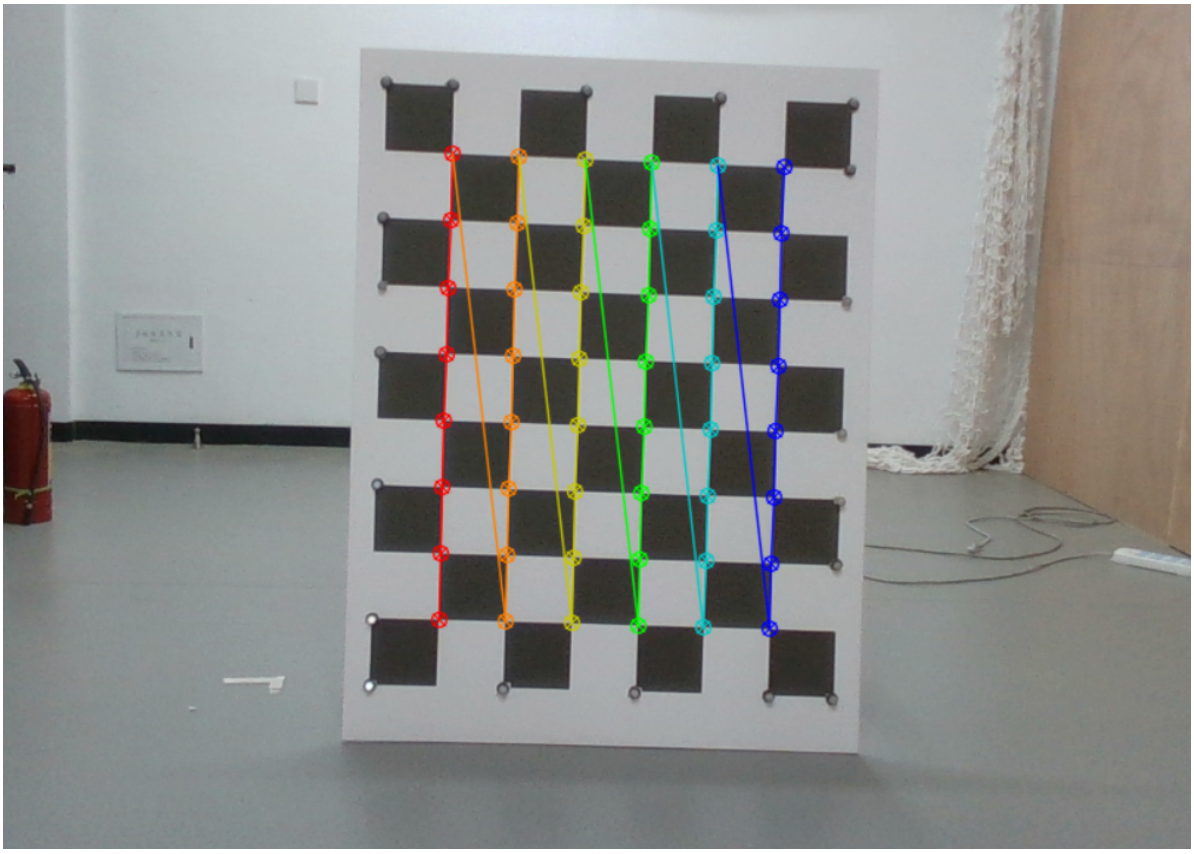
1、计算相机与标定板之间的位姿（T_cb）

使用棋盘格

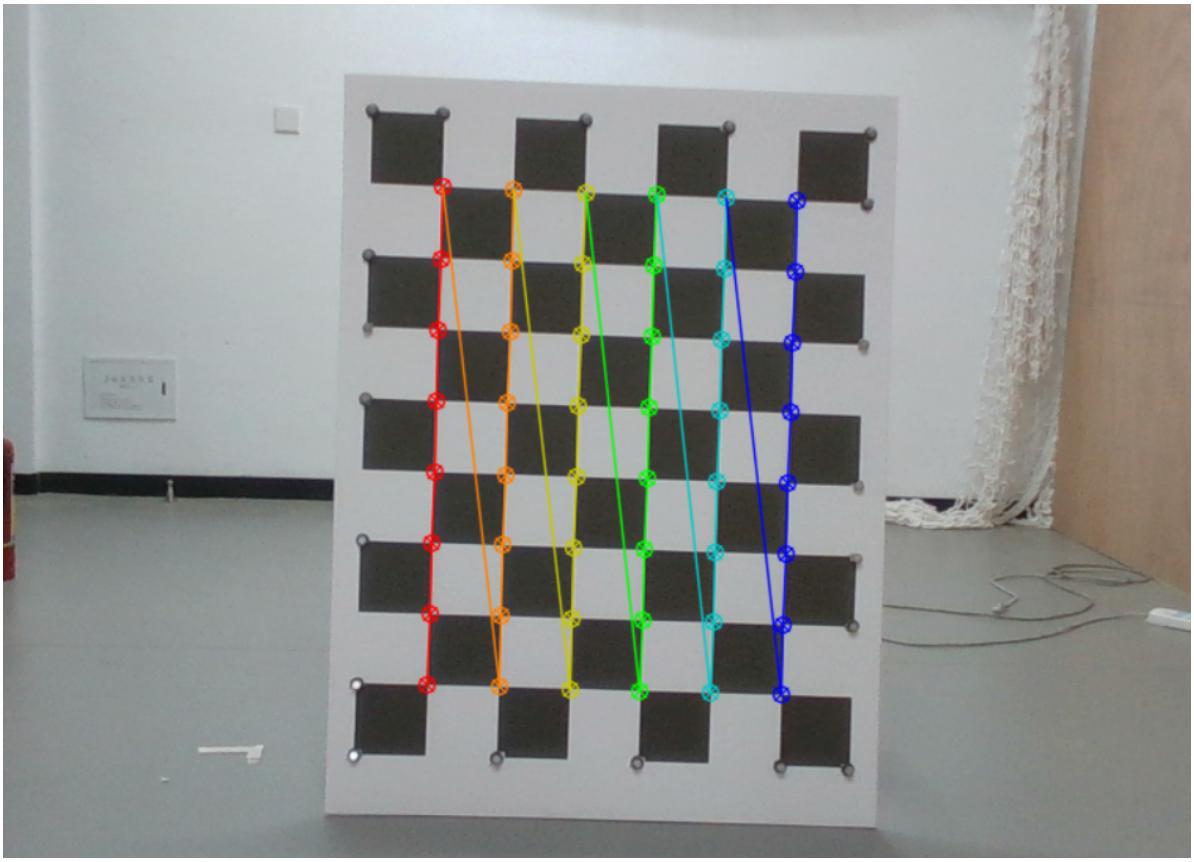
（1）通过标定板尺寸，定义标定板平面坐标系



（2）检测脚点8*6 = 48个



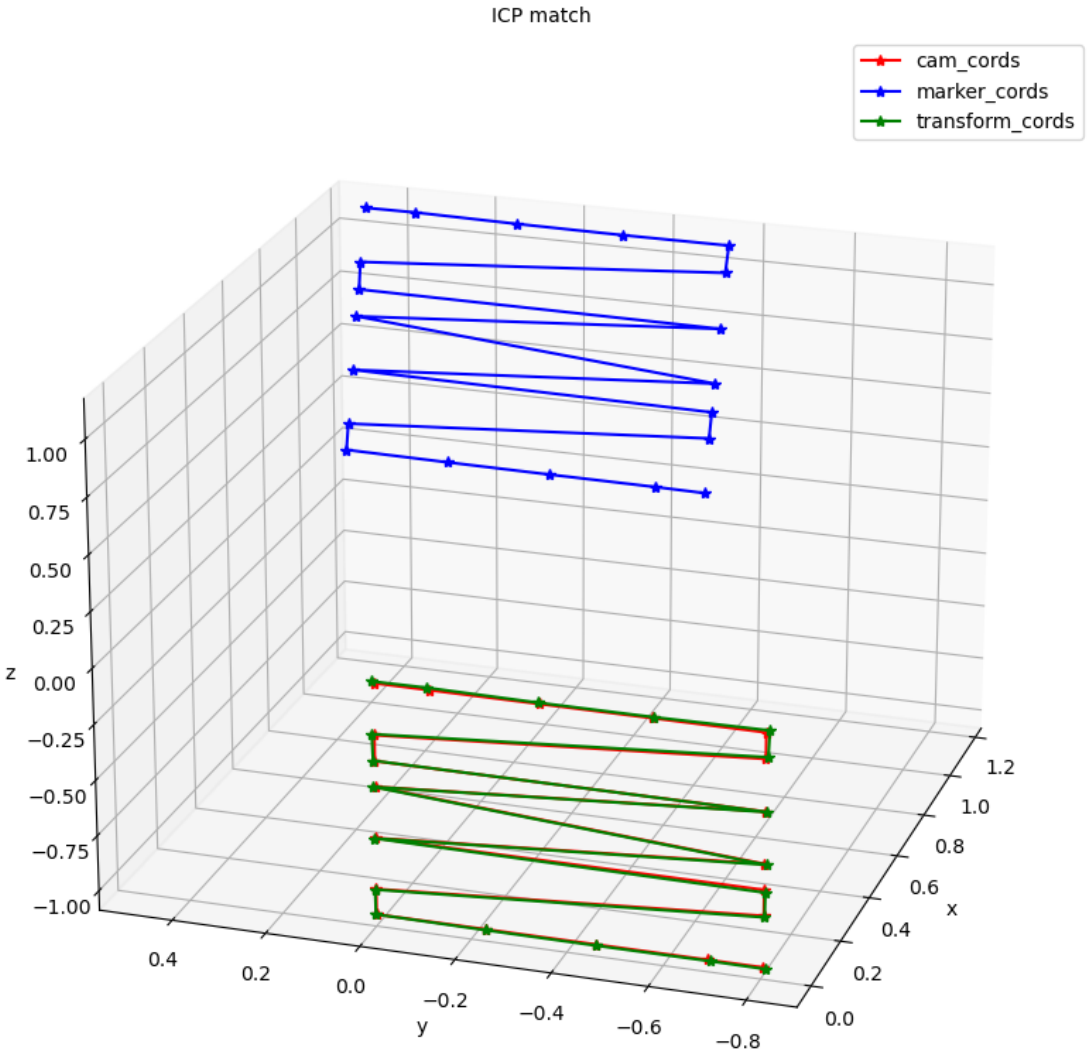
（3）通过PNP计算旋转和平移，API返回的是相机相对于标定板坐标系的变换，通过将角点重投影到相机平面，得到



像素误差： 0.226 Pixels

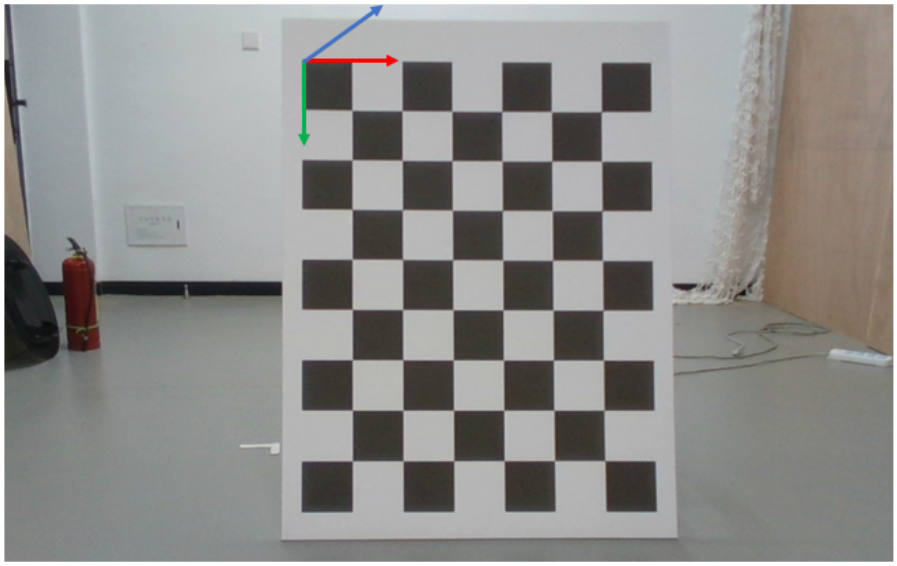
2、计算标定板坐标系与动捕坐标系的变换 （T_bo）

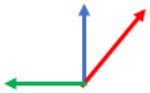
定义20个marker在标定板坐标系的下的坐标，通过动捕获取这些marker的坐标，根据ICP进行相对位姿估计




```
loss:
 [0.00839943 0.01021965 0.00781861 0.00478687 0.00926468 0.00691634
 0.00688175 0.0035599  0.0055862  0.00431339 0.00509621 0.0023083
 0.00934464 0.00490155 0.00521904 0.0065781  0.00619972 0.00657288
 0.00979527 0.00891748]
```

3、计算相机坐标系与动捕坐标系的变换（T_co）





动捕

坐标系转换后得到

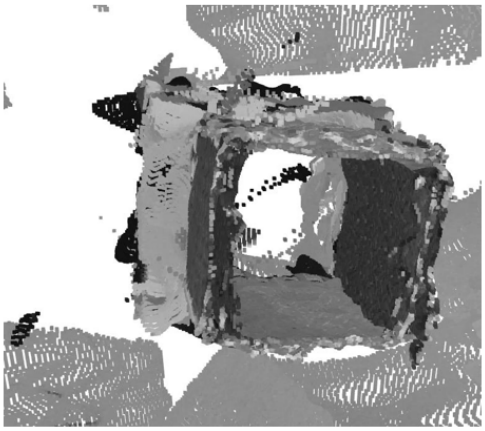
$$Tco = T_{t2}T_{cb}T_{t1}T_{bo}T_{ou}$$

4、计算相机坐标系与无人机刚体坐标系的变换

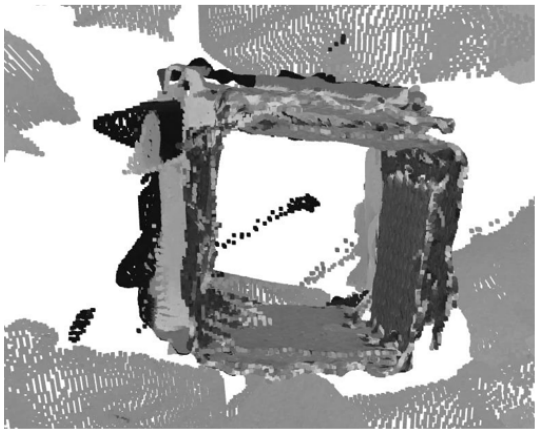
$$T_{offset} = (T_{co}T_{ou})^{-1}$$

标定结果

ICP+PNP标定 与原始ICP标定结果对比



ICP+PNP



ICP

meshlab测量最大误差由5cm降低到2.5cm，可以看到新方法更加准确