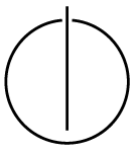

EX4: Tiny Reconstruction

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Problem Description

In this task, your objective is to find the relative pose based on a set of correspondences. There are 3 cameras in the scene with unknown poses but known calibration. All cameras are described using a pinhole model, provided in the following format as in previous exercises:

```
pinhole <width> <height> <focal x> <focal y> <center x> <center y>
```

You are then given a set of landmark observations. Each line contains the coordinates of the landmark projections (x y) onto the first, second, and third cameras. If the landmark is not observable from a particular camera or was not detected, the corresponding coordinates are given as -1 -1.

Your task is to find and report the relative pose between the third and first cameras (transformation from the third camera to the first). As the magnitude of the translation vector is not observable, you should scale it to a length of 1.

It is guaranteed that:

- At least 8 landmarks are observable simultaneously on the first and second cameras.
- At least 8 landmarks are observable simultaneously on the second and third cameras.
- At least 1 landmark is observable simultaneously on all three cameras.

Sample Input/Output

Here is a sample input and output for this problem:

Input

```
pinhole 1280 720 440 401 681 413
pinhole 1280 720 419 430 656 400
pinhole 1280 720 484 423 652 385
435.609 433.492 868.107 375.596 560.034 642.669
550.244 602.595 865.761 447.014 -1 -1
 -1 -1 574.964  565.38 18.7244 272.835
 -1 -1 499.123 93.4276 503.413 660.529
 -1 -1 571.062 436.153 715.461 328.619
327.648 337.005 1103.82 268.394 -1 -1
 -1 -1  324.38 616.871 306.218 225.032
 -1 -1 494.309 549.315 224.901 288.904
 -1 -1 343.368 374.837 527.672 376.262
 253.93 472.737 1087.32 251.541 -1 -1
 -1 -1 592.521 299.614 631.152 447.527
502.501 541.123 935.675 426.529 -1 -1
 -1 -1 324.448 473.316 527.112  318.23
 -1 -1 461.821   220.8  433.12 568.048
 -1 -1 680.261 360.147 287.717 623.014
 -1 -1 555.888 496.768 150.229 373.524
 -1 -1 556.753 256.533 281.175 683.093
 -1 -1 317.384 574.301 383.246 260.861
 -1 -1 632.631 248.156 360.269 714.806
 -1 -1 627.842 599.114 454.104 240.064
341.377 385.034 1089.32 290.079 -1 -1
1224.68 239.023 668.413 530.994 558.845 305.598
756.005 238.006 1025.61 630.238 813.436 199.184
 103.82 491.141 972.076 227.746 -1 -1
726.841 369.594 1086.02 662.634 -1 -1
377.341 407.312 951.041 338.675 -1 -1
```

Output

```
 -0.273345  -0.955043   0.114785 -0.0574385
 -0.954236   0.254175  -0.157574 -0.0629376
  0.121315  -0.152604  -0.980813   0.996363
```