The Gold Standard method

- An initial estimate of F using the normalized 8-point algorithm.

- Extract two camera matrices

  $P = [I \mid 0]$ and $P' = [[e']_{\times} F \mid e']$ with e′ obtained from F

- Estimate the 3D positions of the real-world points, from the correspondences and F.

- Project the 3D points back to image planes using the estimate of the camera projection matrices

- Minimize the difference in the real points and the backprojected points

  by varying P and P′ and the coordinates of the 3D points (and thus also implicitly by varying F).

The Gold Standard method

Minimize a geometric distance (cost):

$$\sum_i d\left(\mathrm{x}_i, \hat{\mathrm{x}}_i\right)^2 + d\left(\mathrm{x}'_i, \hat{\mathrm{x}}'_i\right)^2 \qquad \text{subject to } \hat{\mathrm{x}}'^{\mathrm{T}} \mathrm{F} \hat{\mathrm{x}} = 0$$

Minimize cost using Levenberg-Marquardt

__summary:__

Initialize: normalized 8-point, (P,P‘) from F, reconstruct X_i

$$\mathrm{P} = [\mathrm{I} \mid 0], \mathrm{P}' = [\mathrm{M} \mid \mathrm{t}], \mathrm{X}_i$$

$$\hat{\mathrm{x}}_i = \mathrm{P}\mathrm{X}_i, \hat{\mathrm{x}}_i = \mathrm{P}'\mathrm{X}_i$$

Iterate over P' and X to minimize the cost function

3*n (for each point)* + 12 (for P') parameters.

Once P'= [M | *t*] is found, compute $\mathrm{F} = [\mathbf{t}]_\times \mathrm{M}$.