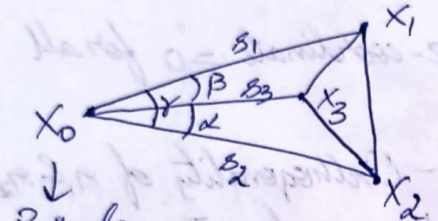
Projective 3 Point (P3P) Algo:

- To localize camera
- We estimate R, X_0
- 3 points or more needed.
- Better is 4 points at least in world frame
- Pre-requisite: Calibrated camera



$X_0X_1 = s_1$
$X_0X_2 = s_2$
$X_0X_3 = s_3$

Projection center

$\angle X_1X_0X_3 = \beta$

$\angle X_3X_0X_2 = \alpha$

$\angle X_1X_0X_2 = \gamma$

- 2-step approach
  - ⊗ Predict s_1, s_2, s_3 – Key step
  - ⊗ Compute R, X_0
- 4 degree polynomial to solve for one side length obtained from cosine rule
- Gives 4 possible sets of $\{s_1, s_2, s_3\}$
- Hence the 4th point for uniquely identifying the best set
- From these, we can estimate R and X_0
- Direct and not iterative, without any initial guess
- The 4 solutions are from moving the triangle of the 3 pts by fixing 2 points, and hence 4th pt needed
- Avoid critical cylinder, 3 points on base/circle and proj center on cylinder surface