- Normalize image points
  - **Centroid is at the origin**. We create the matrix T_{trans} for each camera like this:
$$\begin{bmatrix} 1 & 0 & -\mu_x \\ 0 & 1 & -\mu_y \\ 0 & 0 & 1 \end{bmatrix} \tag{1}$$
    And we multiply each point of the cameras to they corresponding T matrix like this: Tx_i.
  - **RMS distance from the origin is $\sqrt{2}$.** First compute the RMS of the available points:
$$\sqrt{\frac{1}{n}\sum_{i=1}^{n}((x_i-\mu_x)^2+(y_i-\mu_y)^2))} \tag{2}$$
    Then create T_{scale} and multiply it to each point in the camera. T is:
$$T_s = \begin{bmatrix} \sqrt{2}/RMS & 0 & 0 \\ 0 & \sqrt{2}/RMS & 0 \\ 0 & 0 & 1 \end{bmatrix} \tag{3}$$
- **Multiply each point by $T_n = T_sT_t$ like this $[u\ v\ 1]' = T_nx$. Do it for each camera.**
- **Solve** $x_n'Fx_n = 0$. To do this we need to form the system $Af = 0$ and solve for f. The matrix A is:
$$A = \begin{bmatrix} u_1'u_1 & u_1'v_1 & u_1' & v_1'u_1 & v_1'v_1 & v_1' & u_1 & v_1 & 1 \\ u_2'u_2 & u_2'v_2 & u_2' & v_2'u_2 & v_2'v_2 & v_2' & u_2 & v_2 & 1 \\ u_3'u_3 & u_3'v_3 & u_3' & v_3'u_3 & v_3'v_3 & v_3' & u_3 & v_3 & 1 \\ & & & & \vdots & & & & \\ u_n'u_n & u_n'v_n & u_n' & v_n'u_n & v_n'v_n & v_n' & u_n & v_n & 1 \end{bmatrix} F = 0 \tag{4}$$
- **Find least square solution of** $Af = 0$.
  - First find SVD of A $USV = A$.
  - Choose F_{Norm} to be the last column of V
- **Enforcing Singularity**
  - For $F_{Norm} = USV^T$

– Set S_3=0 for

$$F_{norm} = U \begin{bmatrix} S_1 & 0 & 0 \\ 0 & S_2 & 0 \\ 0 & 0 & S_3 \end{bmatrix} V^T \tag{5}$$

- **Denormalisation**

$$F = T_{NormLeft} * F_{Norm} * T_{NormRight} \tag{6}$$