~~$P_i = f_i$~~

$P_i : i = \{1, \dots, m\}$ set of m point in frame, I.
$Q_j : j = \{1 \dots m\}$ set of m point in frame, J.

$$\vec{P_i} = R^I_J \vec{Q_j} + t^I_J \longrightarrow (1).$$

Dropping suffixes.

$$\vec{P_i} = R^I_J Q_i + t \quad \text{or} \quad \vec{P_i} = R\vec{Q_i} + \vec{t} \longrightarrow (2).$$

To solve for <u>R and t</u>.

Use Z-Y-X Euler angles to represent R^I_J or R as.

$$\begin{bmatrix} c\alpha c\beta & c\alpha s\beta s\gamma - s\alpha c\gamma & c\alpha s\beta c\gamma + s\alpha s\gamma \\ s\alpha c\beta & s\alpha s\beta s\gamma + c\alpha c\gamma & s\alpha s\beta c\gamma - c\alpha s\gamma \\ -s\beta & c\beta s\gamma & c\beta c\gamma \end{bmatrix} \longrightarrow (3)$$

or
$$R = \begin{bmatrix} 1 & -\alpha & \beta \\ \alpha & 1 & -\gamma \\ -\beta & \gamma & 1 \end{bmatrix} \longrightarrow (4)$$

<u>Using</u> small angle approximations to get (4)

$\boxed{c\alpha = 1, \quad s\alpha = \alpha, \quad s\alpha . s\beta = 0 \text{ etc}}$

Then.

1st correspondence.

$$\begin{bmatrix} 1 & -\alpha & \beta \\ \alpha & 1 & -\gamma \\ -\beta & \gamma & 1 \end{bmatrix} \begin{bmatrix} Q_{x_1} \\ Q_{y_1} \\ Q_{z_1} \end{bmatrix} + \begin{bmatrix} t_x \\ t_y \\ t_z \end{bmatrix} = \begin{bmatrix} P_{x_1} \\ P_{y_1} \\ P_{z_1} \end{bmatrix} \longrightarrow (5)$$

Be careful ~~to~~ about which frames are these vectors represented in.