

given

$p_i \in \mathbb{R}^3$ points on lines

$d_i \in \mathbb{R}^3$ unit directions along lines

$$P_i = (I_3 - d_i d_i^T)$$

$$q = \left(\sum_i P_i^T P_i \right)^{-1} \left(\sum_i P_i^T P_i p_i \right)$$