given

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

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

$$P_i = \left(I_3 - d_i d_i^T\right)$$

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