

given

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

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

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

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