

$$\sum_i \|\tilde{y}_i - \tilde{x}_i'\|^2 = \sum_i \|\tilde{x}_i - \tilde{y}_i'\|^2$$

$$\|\tilde{y}_i\|^2 + \|\tilde{x}_i'\|^2 - 2(\tilde{y}_i, \tilde{x}_i') = \|\tilde{x}_i\|^2 + \|\tilde{y}_i'\|^2 - 2(\tilde{x}_i', \tilde{y}_i')$$

$$\therefore (\tilde{y}_i, \tilde{x}_i') = (\tilde{x}_i', \tilde{y}_i')$$

$$\text{左边} = \mathbf{Q}^T [\tilde{\mathbf{y}}]_L^T [\tilde{\mathbf{x}}]_R \mathbf{Q}$$

$$\text{右边} = (\mathbf{Q} \otimes \tilde{\mathbf{x}}_i \otimes \mathbf{Q}^*, \mathbf{y}_i) = (\tilde{\mathbf{x}}_i, \tilde{\mathbf{y}}_i \otimes \mathbf{Q}) = ([\tilde{\mathbf{x}}]_R \mathbf{Q})^T ([\tilde{\mathbf{y}}]_L \mathbf{Q}) = \mathbf{Q}^T [\tilde{\mathbf{x}}]_R^T [\tilde{\mathbf{y}}]_L \mathbf{Q}$$

$$\therefore [\tilde{\mathbf{y}}]_L^T [\tilde{\mathbf{x}}]_R = [\tilde{\mathbf{x}}]_R^T [\tilde{\mathbf{y}}]_L \quad \therefore \Lambda \text{ 实矩阵对称}$$

$$\Lambda = \Lambda^T$$