

$$A = \begin{pmatrix} a_{11} & a_{12} & a_{13} & a_{14} & a_{15} \\ a_{21} & a_{22} & a_{23} & a_{24} & a_{25} \\ a_{31} & a_{32} & a_{33} & a_{34} & a_{35} \\ a_{41} & a_{42} & a_{43} & a_{44} & a_{45} \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} \end{pmatrix}$$

$$a_1 = \begin{pmatrix} a_{11} \\ a_{21} \\ a_{31} \\ a_{41} \\ a_{51} \\ a_{61} \\ a_{71} \end{pmatrix}, \alpha_1 = \pm \|a_1\|, \tilde{v}_1 = \begin{pmatrix} a_{11} + \alpha_1 \\ a_{21} \\ a_{31} \\ a_{41} \\ a_{51} \\ a_{61} \\ a_{71} \end{pmatrix}, v_1 = \tilde{v}_1 / \|\tilde{v}_1\| = \begin{pmatrix} w_1 \\ w_2 \\ w_3 \\ w_4 \\ w_5 \\ w_6 \\ w_7 \end{pmatrix}$$

$$Q_1 = (I - 2v_1v_1^t) =$$

$$\begin{pmatrix} 1 - 2w_1w_1 & -2w_1w_2 & -2w_1w_3 & -2w_1w_4 & -2w_1w_5 & -2w_1w_6 & -2w_1w_7 \\ -2w_2w_1 & 1 - 2w_2w_2 & -2w_2w_3 & -2w_2w_4 & -2w_2w_5 & -2w_2w_6 & -2w_2w_7 \\ -2w_3w_1 & -2w_3w_2 & 1 - 2w_3w_3 & -2w_3w_4 & -2w_3w_5 & -2w_3w_6 & -2w_3w_7 \\ -2w_4w_1 & -2w_4w_2 & -2w_4w_3 & 1 - 2w_4w_4 & -2w_4w_5 & -2w_4w_6 & -2w_4w_7 \\ -2w_5w_1 & -2w_5w_2 & -2w_5w_3 & -2w_5w_4 & 1 - 2w_5w_5 & -2w_5w_6 & -2w_5w_7 \\ -2w_6w_1 & -2w_6w_2 & -2w_6w_3 & -2w_6w_4 & -2w_6w_5 & 1 - 2w_6w_6 & -2w_6w_7 \\ -2w_7w_1 & -2w_7w_2 & -2w_7w_3 & -2w_7w_4 & -2w_7w_5 & -2w_7w_6 & 1 - 2w_7w_7 \end{pmatrix}$$

$$Q_1A = \begin{pmatrix} -\alpha_1 & r_{12} & r_{13} & r_{14} & r_{15} \\ 0 & b_{11} & b_{12} & b_{13} & b_{14} \\ 0 & b_{21} & b_{22} & b_{23} & b_{24} \\ 0 & b_{31} & b_{32} & b_{33} & b_{34} \\ 0 & b_{41} & b_{42} & b_{43} & b_{44} \\ 0 & b_{51} & b_{52} & b_{53} & b_{54} \\ 0 & b_{61} & b_{62} & b_{63} & b_{64} \end{pmatrix}$$

$$\tilde{v}_2 = \begin{pmatrix} b_{11} + \alpha_2 \\ b_{21} \\ b_{31} \\ b_{41} \\ b_{51} \\ b_{61} \end{pmatrix}, v_2 = \tilde{v}_2 / \|\tilde{v}_2\|, Q_2 = \begin{pmatrix} 1 & 0 & \cdots & 0 \\ 0 & & & \\ \vdots & (I - 2v_2v_2^t) & & \\ 0 & & & \end{pmatrix}$$

$$Q_2 Q_1 A = \begin{pmatrix} -\alpha_1 & r_{12} & r_{13} & r_{14} & r_{15} \\ 0 & -\alpha_2 & r_{23} & r_{24} & r_{25} \\ 0 & 0 & c_{11} & c_{12} & c_{13} \\ 0 & 0 & c_{21} & c_{22} & c_{23} \\ 0 & 0 & c_{31} & c_{32} & c_{33} \\ 0 & 0 & c_{41} & c_{42} & c_{43} \\ 0 & 0 & c_{51} & c_{52} & c_{53} \end{pmatrix}$$

$$\tilde{v}_3 = \begin{pmatrix} c_{11} + \alpha_3 \\ c_{21} \\ c_{31} \\ c_{41} \\ c_{51} \end{pmatrix}, v_3 = \tilde{v}_3 / \|\tilde{v}_3\|, Q_3 = \begin{pmatrix} 1 & 0 & 0 & \cdots & 0 \\ 0 & 1 & 0 & \cdots & 0 \\ 0 & 0 & & & \\ \vdots & \vdots & & (I - 2v_3v_3^t) & \\ 0 & 0 & & & \end{pmatrix}$$

$$Q_3Q_2Q_1A = \begin{pmatrix} -\alpha_1 & r_{12} & r_{13} & r_{14} & r_{15} \\ 0 & -\alpha_2 & r_{23} & r_{24} & r_{25} \\ 0 & 0 & -\alpha_3 & r_{34} & r_{35} \\ 0 & 0 & 0 & d_{11} & d_{12} \\ 0 & 0 & 0 & d_{21} & d_{22} \\ 0 & 0 & 0 & d_{31} & d_{32} \\ 0 & 0 & 0 & d_{41} & d_{42} \end{pmatrix}$$

$$Q_4 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & & & & \\ 0 & 0 & 0 & (I - 2v_4v_4^t) & & & \\ 0 & 0 & 0 & & & & \\ 0 & 0 & 0 & & & & \end{pmatrix}$$

$$Q_4Q_3Q_2Q_1A = \begin{pmatrix} -\alpha_1 & r_{12} & r_{13} & r_{14} & r_{15} \\ 0 & -\alpha_2 & r_{23} & r_{24} & r_{25} \\ 0 & 0 & -\alpha_3 & r_{34} & r_{35} \\ 0 & 0 & 0 & -\alpha_4 & r_{45} \\ 0 & 0 & 0 & 0 & e_{12} \\ 0 & 0 & 0 & 0 & e_{22} \\ 0 & 0 & 0 & 0 & e_{32} \end{pmatrix}$$

$$Q_5 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & & & \\ 0 & 0 & 0 & 0 & (I - 2v_5v_5^t) & & \\ 0 & 0 & 0 & 0 & & & \end{pmatrix}$$

$$Q_5Q_4Q_3Q_2Q_1A = \begin{pmatrix} -\alpha_1 & r_{12} & r_{13} & r_{14} & r_{15} \\ 0 & -\alpha_2 & r_{23} & r_{24} & r_{25} \\ 0 & 0 & -\alpha_3 & r_{34} & r_{35} \\ 0 & 0 & 0 & -\alpha_4 & r_{45} \\ 0 & 0 & 0 & 0 & -\alpha_5 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$