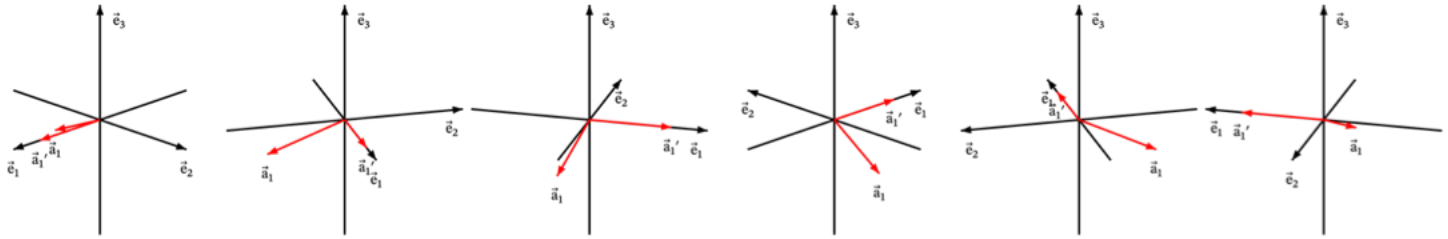
Reflecting column $\vec{a}_1$:

- the target vector $\vec{a}_1'$ satisfies the following:

  - $\vec{a}_1' \in \text{span}\{\vec{e}_1\} \rightarrow (\vec{a}_1')_2 = (\vec{a}_1')_3 = 0$

  - $|\vec{a}_1'| = |\vec{a}_1|$

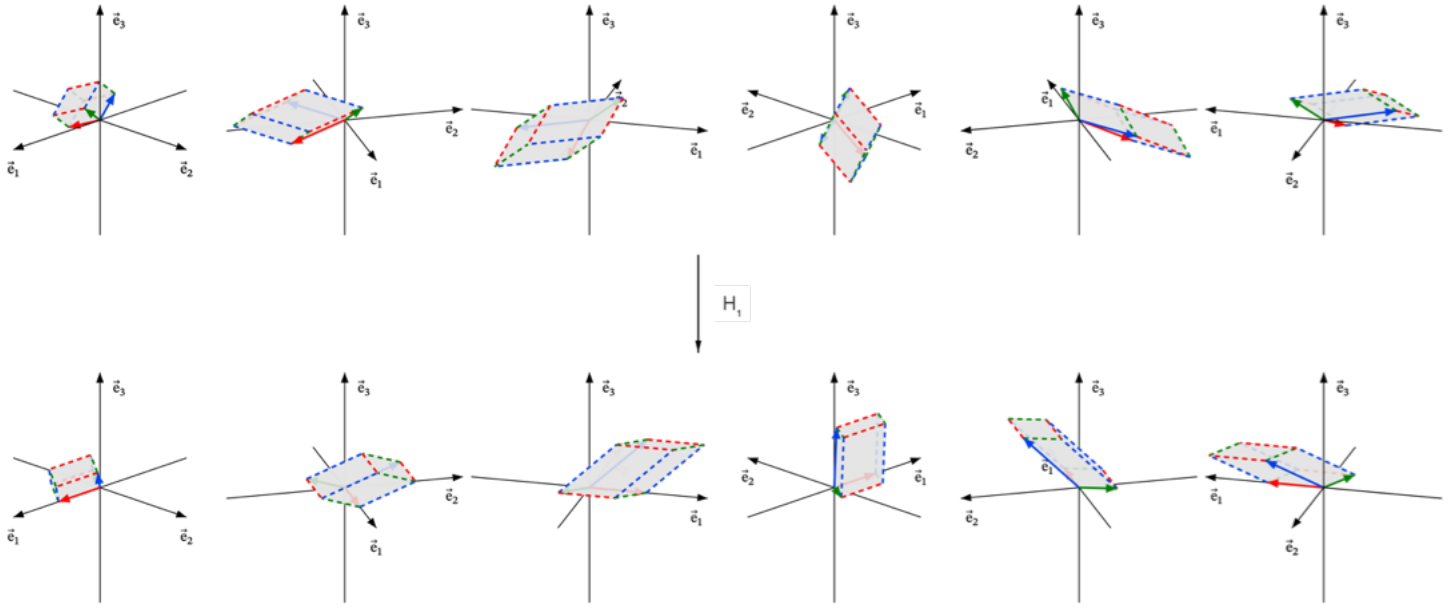
  - $(\vec{a}_1')_1$ is chosen with sign opposite to $(\vec{a}_1)_1$



$$\vec{a}_1' = \begin{bmatrix} 2.215333 \\ 0 \\ 0 \end{bmatrix} \qquad \vec{v} = \vec{a}_1 - \vec{a}_1' = \begin{bmatrix} -2.555333 \\ -2 \\ -0.89 \end{bmatrix}$$

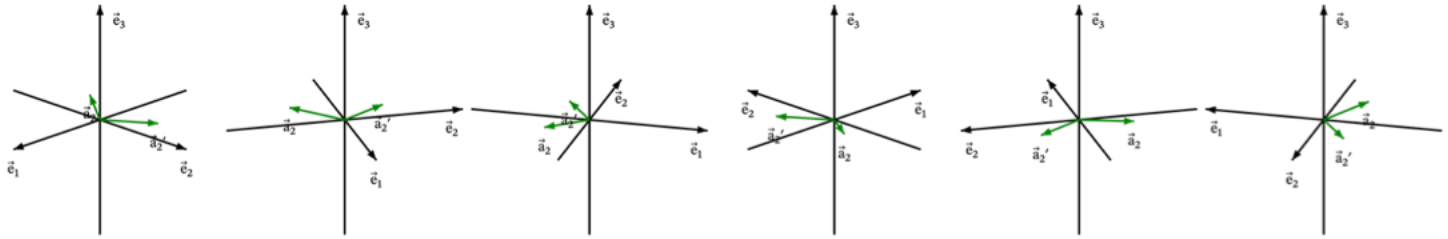
$$H_1 = I - \frac{2\,\vec{v}\,\vec{v}^T}{\vec{v}^T\,\vec{v}} = \begin{bmatrix} \approx -0.153476 & \approx -0.902799 & \approx -0.401745 \\ \approx -0.902799 & \approx 0.2934 & -0.314437 \\ \approx -0.401745 & -0.314437 & \approx 0.860076 \end{bmatrix}$$

$$A_1 = \begin{bmatrix} 2.215333 & \approx -0.882305 & \approx 1.820358 \\ 0 & -1.257599 & \approx 1.691004 \\ 0 & \approx 0.151268 & \approx 1.503397 \end{bmatrix}$$



Reflecting column $\vec{a}_2$:

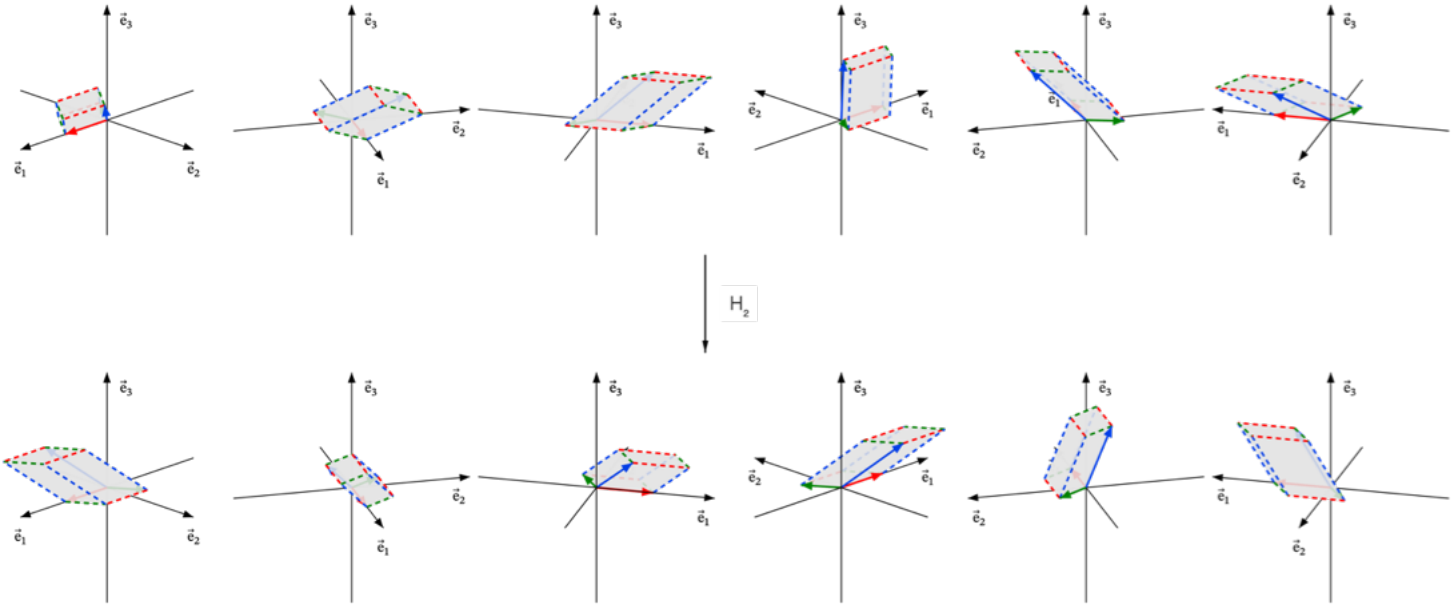
- the target vector $\vec{a}_2'$ satisfies the following:
  - $\vec{a}_2' \in \text{span}\{\vec{e}_1, \vec{e}_2\} \rightarrow (\vec{a}_2')_3 = 0$
  - $|\vec{a}_2'| = |\vec{a}_2|$
  - $(\vec{a}_2')_2$ is chosen with sign opposite to $(\vec{a}_2)_2$



$$\vec{a}_2' = \begin{bmatrix} \approx -0.882305 \\ \approx 1.266664 \\ 0 \end{bmatrix} \quad \vec{v} = \vec{a}_2 - \vec{a}_2' = \begin{bmatrix} 0 \\ \approx -2.524263 \\ \approx 0.151268 \end{bmatrix}$$

$$H_2 = I - \frac{2\,\vec{v}\,\vec{v}^T}{\vec{v}^T\,\vec{v}} = \left[\begin{array}{c|cc} 1 & 0 & 0 \\ \hline 0 & \approx -0.992843 & \approx 0.119423 \\ 0 & \approx 0.119423 & \approx 0.992843 \end{array}\right]$$

$$A_2 = R = \left[\begin{array}{c|cc} 2.215333 & \approx -0.882305 & \approx 1.820358 \\ \hline 0 & \approx 1.266664 & \approx -1.499362 \\ 0 & 0 & \approx 1.694582 \end{array}\right]$$



$$Q = \left(H_2\ H_1\right)^{\intercal} = \begin{bmatrix} \approx -0.153476 & \approx 0.84836 & -0.506685 \\ \approx -0.902799 & \approx -0.328851 & -0.277148 \\ \approx -0.401745 & \approx 0.414899 & \approx 0.81637 \end{bmatrix}$$