

$$\Rightarrow \det \begin{pmatrix} \frac{19}{576} - \lambda & 0 & 0 \\ 0 & \frac{5}{48} - \lambda & -\frac{1}{96} \\ 0 & -\frac{1}{96} & \frac{55}{576} - \lambda \end{pmatrix} = 0$$

$$\Rightarrow \left(\frac{19}{576} - \lambda \right) \left(\lambda^2 - \frac{115}{576} \lambda + \frac{17}{1728} \right) = 0$$

$$\Rightarrow \lambda_1 = \frac{19}{576} \quad \wedge \quad \lambda_{2,3} = \frac{115}{1752} \pm \frac{13}{1752} = \frac{102}{1752} \quad \wedge \quad \frac{128}{1752}$$

$$= \frac{17}{152} \quad = \frac{1}{9}$$

$$\begin{pmatrix} \frac{19}{576} - \lambda & 0 & 0 \\ 0 & \frac{5}{48} - \lambda & -\frac{1}{96} \\ 0 & -\frac{1}{96} & \frac{55}{576} - \lambda \end{pmatrix} \vec{v} = 0$$

$$\lambda_1: \begin{pmatrix} 0 & 0 & 0 \\ 0 & \frac{41}{576} & -\frac{1}{96} \\ 0 & -\frac{1}{96} & \frac{1}{76} \end{pmatrix} \vec{v}_1 = 0 \Rightarrow \begin{cases} \frac{41}{576} v_{1y} - \frac{1}{96} v_{1z} = 0 \\ -\frac{1}{96} v_{1y} + \frac{1}{76} v_{1z} = 0 \end{cases} \left. \begin{matrix} v_{1y} = v_{1z} = 0 \end{matrix} \right\} \checkmark$$

$$\Rightarrow \vec{v}_1 = k \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$\lambda_2: \begin{pmatrix} -\frac{1}{144} & 0 & 0 \\ 0 & \frac{1}{64} & -\frac{1}{96} \\ 0 & -\frac{1}{96} & \frac{1}{144} \end{pmatrix} \vec{v}_2 = 0 \Rightarrow \begin{cases} v_{2x} = 0 \\ \frac{1}{64} v_{2y} - \frac{1}{96} v_{2z} = 0 \Rightarrow v_{2y} - \frac{2}{3} v_{2z} = 0 \\ -\frac{1}{96} v_{2y} + \frac{1}{144} v_{2z} = 0 \Rightarrow v_{2y} - \frac{2}{3} v_{2z} = 0 \end{cases}$$

$$\Rightarrow v_{2y} = \frac{2}{3} v_{2z} \Rightarrow \vec{v}_2 = k \begin{pmatrix} 0 \\ 2 \\ 3 \end{pmatrix}$$

$$\lambda_3: \begin{pmatrix} -\frac{5}{64} & 0 & 0 \\ 0 & -\frac{1}{144} & -\frac{1}{96} \\ 0 & -\frac{1}{96} & -\frac{1}{64} \end{pmatrix} \vec{v}_3 = 0 \Rightarrow v_{3x} = 0$$

$$\begin{cases} -\frac{1}{144} v_{3y} - \frac{1}{96} v_{3z} = 0 \Rightarrow \frac{2}{3} v_{3y} + v_{3z} = 0 \\ -\frac{1}{96} v_{3y} - \frac{1}{64} v_{3z} = 0 \Rightarrow \frac{2}{3} v_{3y} + v_{3z} = 0 \end{cases} \left. \begin{matrix} v_{3z} = -\frac{2}{3} v_{3y} \end{matrix} \right\}$$

$$\Rightarrow \vec{v}_3 = k \begin{pmatrix} 0 \\ -3 \\ 2 \end{pmatrix}$$

$$\Rightarrow \text{Hauptachsen: } \vec{v}_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}, \vec{v}_2 = \begin{pmatrix} 0 \\ 2 \\ 3 \end{pmatrix}, \vec{v}_3 = \begin{pmatrix} 0 \\ -3 \\ 2 \end{pmatrix} \checkmark$$

$$\hat{I}_{Ha} = \begin{pmatrix} \frac{19}{576} & 0 & 0 \\ 0 & \frac{102}{1752} & 0 \\ 0 & 0 & \frac{128}{1752} \end{pmatrix}$$

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