

## T5A77 自動控制

(105/12/15 三版) 書籍勘誤

p60:

例 1: 求矩陣  $A$  之特性值與特性向量

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & -1 \\ 0 & 2 & 3 \end{bmatrix}$$

解:

$$\Delta(\lambda) = |\lambda \mathbf{I} - \mathbf{A}| = \begin{vmatrix} \lambda & -1 & 0 \\ 0 & \lambda & 1 \\ 0 & -2 & \lambda - 3 \end{vmatrix} = \lambda^3 - 3\lambda^2 + 2\lambda = 0$$

得  $\lambda_1=0$ ,  $\lambda_2=1$ ,  $\lambda_3=2$

(一) 當  $\lambda_1=0$  時, 由  $(\lambda_1 \mathbf{I} - \mathbf{A})\mathbf{x}_1 = \mathbf{0} \rightarrow$

$$\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & -1 \\ 0 & 2 & 3 \end{bmatrix} \begin{bmatrix} x_{11} \\ x_{21} \\ x_{31} \end{bmatrix} = \mathbf{0}$$

$$x_{11} : x_{21} : x_{31} = \begin{vmatrix} 1 & 0 \\ 0 & -1 \end{vmatrix} : \begin{vmatrix} 0 & 0 \\ -1 & 0 \end{vmatrix} : \begin{vmatrix} 0 & 1 \\ 0 & 0 \end{vmatrix} = 1:0:0$$

$$\text{取} \begin{bmatrix} x_{11} \\ x_{21} \\ x_{31} \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

(二) 當  $\lambda_2=1$  時, 由  $(\lambda_2 \mathbf{I} - \mathbf{A})\mathbf{x}_2 = \mathbf{0} \rightarrow$

$$\begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & -2 \end{bmatrix} \begin{bmatrix} x_{11} \\ x_{21} \\ x_{31} \end{bmatrix} = \mathbf{0}$$

$$x_{11} : x_{21} : x_{31} = \begin{vmatrix} -1 & 0 \\ 1 & 1 \end{vmatrix} : \begin{vmatrix} 0 & 1 \\ 1 & 0 \end{vmatrix} : \begin{vmatrix} 1 & -1 \\ 0 & 1 \end{vmatrix} = -1:-1:1$$

$$\text{取} \begin{bmatrix} x_{12} \\ x_{22} \\ x_{32} \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}$$

(三) 當  $\lambda_3=2$  時，由  $(\lambda_3 I - A)\mathbf{x}_3 = \mathbf{0} \rightarrow$

$$\begin{bmatrix} 2 & -1 & 0 \\ 0 & 2 & 1 \\ 0 & -2 & -1 \end{bmatrix} \begin{bmatrix} x_{11} \\ x_{21} \\ x_{31} \end{bmatrix} = \mathbf{0}$$

$$x_{11} : x_{21} : x_{31} = \begin{vmatrix} -1 & 0 \\ 2 & 1 \end{vmatrix} : \begin{vmatrix} 0 & 2 \\ 1 & 0 \end{vmatrix} : \begin{vmatrix} 2 & -1 \\ 0 & 2 \end{vmatrix} = -1 : -2 : 4$$

$$\text{取} \begin{bmatrix} x_{31} \\ x_{32} \\ x_{33} \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ -4 \end{bmatrix}$$