

2-Massen-Schwinger

1. Eigenbewegung

$$x_1(t) = a \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad (a \neq 0)$$

$$T_1 = 2.14 \text{ s}$$

$$f_1 = \frac{1}{T_1} = 0.4673 \text{ Hz}$$

2. Eigenbewegung

$$T_2 = 2.75 \text{ s}$$

$$f_2 = \frac{1}{T_2} = 0.3636 \text{ Hz}$$

$$x_2(t) = a \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

Eigenvektoren

$$x_1 = \frac{1}{\sqrt{2}} \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad x_2 = \frac{1}{\sqrt{2}} \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

3-Massen-Schwinger

1. Eigenbewegung

$$x_1 = \begin{pmatrix} 0.5000 \\ 0.7071 \\ 0.5000 \end{pmatrix}$$

$$f_1 = 0.1218 \text{ Hz}$$

2. Eigenbewegung

$$x_2 = \begin{pmatrix} 0.7071 \\ 0 \\ -0.7071 \end{pmatrix}$$

$$f_2 = 0.2257 \text{ Hz}$$

3. Eigenbewegung

$$x_3 = \begin{pmatrix} 0.5000 \\ -0.7071 \\ 0.5000 \end{pmatrix}$$

$$f_3 = 0.2941 \text{ Hz}$$

Eigenwerte in Kette

$$M\ddot{x} + Cx = 0$$

Eigenvektoren in Matrix Φ

$$\Phi = (\phi_1, \phi_2, \phi_3)$$

$$(\phi_1, \phi_2, \phi_3) \begin{pmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{pmatrix} = \begin{pmatrix} \phi_{1x} \\ \phi_{1y} \\ \phi_{1z} \end{pmatrix}, \begin{pmatrix} \phi_2 \\ \phi_3 \end{pmatrix} \begin{pmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{pmatrix}$$

$$= \begin{pmatrix} a\phi_{1x} & b\phi_{2x} & c\phi_{3x} \\ a\phi_{1y} & \vdots & \vdots \\ a\phi_{1z} & \vdots & \vdots \end{pmatrix} = (a\phi_1, b\phi_2, c\phi_3)$$

$$\Phi' \cdot \Phi = \begin{pmatrix} \phi_1' \\ \phi_2' \\ \phi_3' \end{pmatrix} \cdot (\phi_1, \phi_2, \phi_3) = \begin{pmatrix} \phi_1' \cdot \phi_1 & \phi_1' \cdot \phi_2 & \phi_1' \cdot \phi_3 \\ - & \phi_2' \cdot \phi_2 & - \\ - & - & \phi_3' \cdot \phi_3 \end{pmatrix}$$

Eigenbewegungen des Fachwerks

$$x_1 = \begin{pmatrix} 0,2859 \\ -0,2859 \end{pmatrix} \quad x_2 = \begin{pmatrix} 0,1767 \\ 0,4626 \end{pmatrix} \quad x_3 = \begin{pmatrix} 0,2859 \\ 0,2859 \end{pmatrix} \quad x_4 = \begin{pmatrix} 0,4626 \\ -0,4626 \end{pmatrix}$$

