

Report: Simulation of a Vibrating System

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1 Equations satisfied by the system using Newton's second law of motion.

1.1

$$m_1\ddot{x}_1 = -k_1x_1 + k_2(x_2 - x_1)$$

1.2

$$m_2\ddot{x}_2 = -k_2(x_2 - x_1) + k_3(x_3 - x_2)$$

1.3

$$m_3\ddot{x}_3 = -k_3(x_3 - x_2) - k_4x_3$$

2 System of equations expressed as an eigen problem.

$$Av = \lambda v$$

$$A = \begin{bmatrix} \frac{k_1+k_2}{m_1} & \frac{-k_1}{m_1} & 0 \\ \frac{-k_2}{m_2} & \frac{k_2+k_3}{m_2} & \frac{-k_2}{m_2} \\ 0 & \frac{-k_3}{m_3} & \frac{k_3}{m_3} \end{bmatrix} \text{ where } v \text{ is an eigenvector and } \lambda \text{ is an eigenvalue.}$$