

Assignment IV

ME 3030– Modeling and Simulation (2023-2024)

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Question 1

Consider the two-mass spring-damper system as given in Assignment 1, with the following initial displacement conditions $t = 0$ sec:

$$\begin{aligned} x_1(0) &= 0, y_1(0) = 0, \\ x_2(0) &= 0.5, y_2(0) = 0, \end{aligned}$$

and boundary conditions at $t = 2$ sec:

$$\begin{aligned} x_1(2) &= 1, y_1(2) = 1, \\ x_2(2) &= 1, y_2(2) = 1.5, \end{aligned}$$

as shown in Figure 1.

Find the initial velocity conditions $\dot{x}_1(0)$, $\dot{y}_1(0)$, $\dot{x}_2(0)$, and $\dot{y}_2(0)$ such that the system will reach the final configuration in 2 seconds. Use the implicit Euler integration technique combined with the Newton Raphson method to solve the boundary value problem.

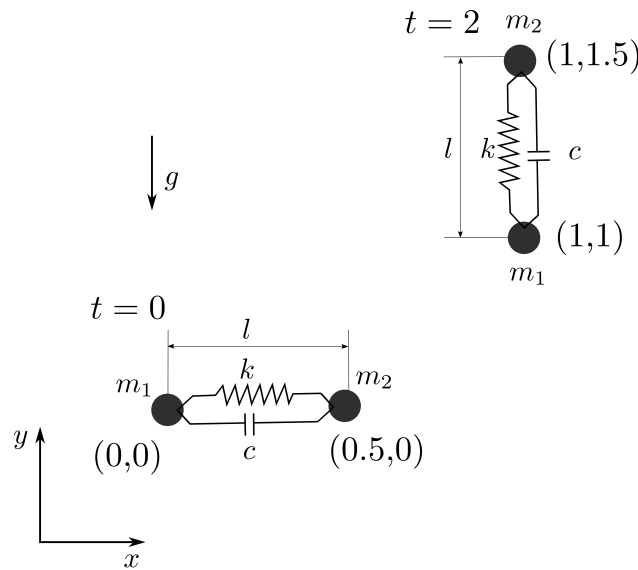


Figure 1: Schematic of the two-mass spring-damper system at $t = 0$ sec and $t = 2$ sec.