Model of the Mass-Spring-Damper System

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Dynamics of the first mass point is given by

$$M_1\ddot{p}_1 - C_1(\dot{p}_2 - \dot{p}_1) - K_1(p_2 - p_1) = F_1, \tag{1}$$

while the movement of the subsequent mass points are expressed as,

$$M_i\ddot{p}_i - C_i(\dot{p}_{i+1} - \dot{p}_i) + C_{i+1}(\dot{p}_i - \dot{p}_{i-1}) - K_i(p_{i+1} - p_i) + K_{i-1}(p_i - p_{i-1}) = 0, \tag{2}$$

and the dynamics of the last mass point is given by

$$M_N\ddot{p}_N - C_{N-1}(\dot{p}_N - \dot{p}_{N-1}) + K_N(p_N - p_{N-1}) = 0. \tag{3}$$

Notation:

Quantity	Symbol	Units
mass	M	kg
spring stiffness	K	$\mathrm{N\,m^{-1}}$
damper coefficient	C	$\mathrm{kg\,s^{-1}}$

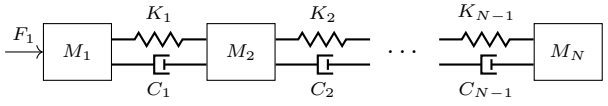

Figure 1: Scheme of N mass points inter-connected with spring with stiffness K_i and dampers C_i, for $i \in 1, \ldots, N$.