

System EOM

Model includes: structures rotational inertia (I_θ), structures Coulomb type damping (C_a), structures linear proportional damping (C_B), structures restoring force (τ_{sp}), and the systems fluid loading (τ_{fluid}).

$$I_\theta \ddot{\theta} + C_a \text{sign}(\dot{\theta}) + C_b \dot{\theta} + \tau_{sp} = \tau_{fluid}$$

Generic Spring Model

$$\tau_{sp} = \text{sign}(\theta)(a_1 + a_3 * |\theta|^{1.65} + a_4 * \theta^2) + a_2 * \theta + a_5 * \theta^3 \quad , \quad \{\theta \mid b_1 < \theta \leq b_2\}$$

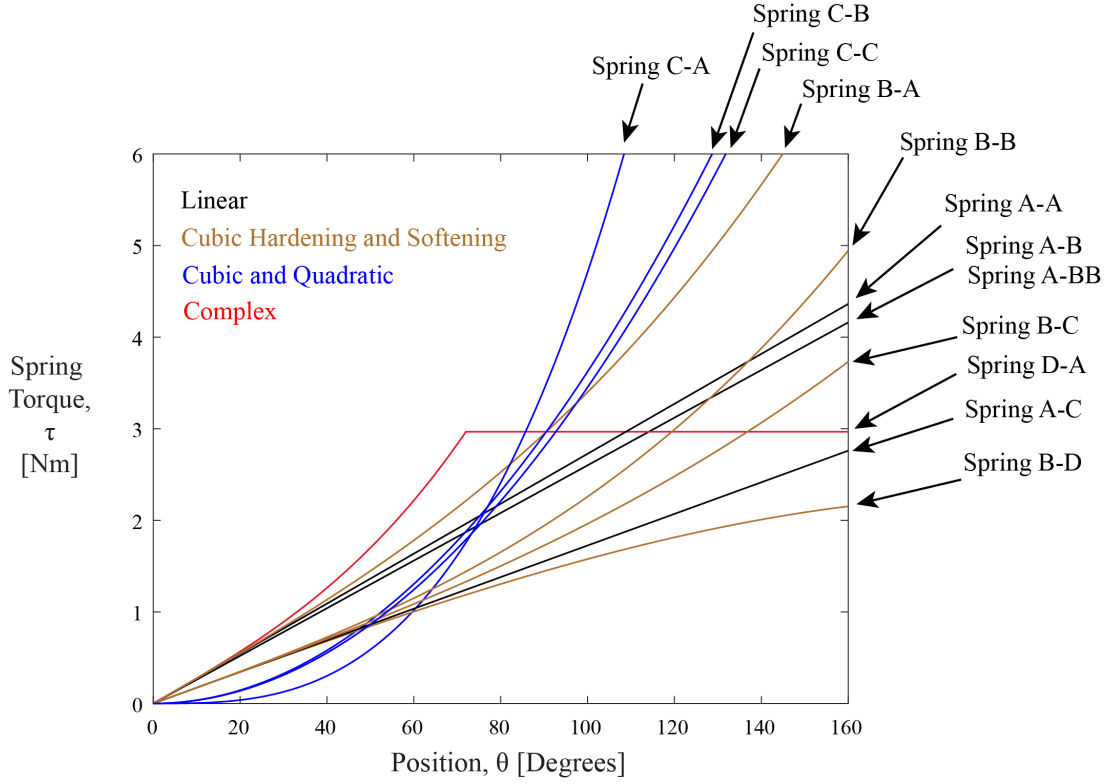


Figure 1: Spring Definitions included in repository

Spring Definitions

S-ID	$\{a_1, a_2, a_3, a_4, a_5, \}$	$\{b_1, b_2\}$
A-A	$a_2 \approx 1.5622$	$\{-\pi, \pi\}$
A-B	$a_2 \approx 1.4900$	$\{-\pi, \pi\}$
A-BB	$a_2 \approx 1.5000$	$\{-\pi, \pi\}$
A-C	$a_2 \approx 0.9884$	$\{-\pi, \pi\}$
B-A	$a_2 \approx 1.5622, a_5 \approx 0.1266$	$\{-\pi, \pi\}$
B-B	$a_2 \approx 0.9884, a_5 \approx 0.1003$	$\{-\pi, \pi\}$
B-C	$a_2 \approx 0.9884, a_5 \approx 0.0446$	$\{-\pi, \pi\}$
B-D	$a_2 \approx 0.9884, a_5 \approx -0.0279$	$\{-\pi, \pi\}$
C-A	$a_5 \approx 0.8861$	$\{-\pi, \pi\}$
C-B	$a_4 \approx 1.1895$	$\{-\pi, \pi\}$
C-C	$a_4 \approx 1.1337$	$\{-\pi, \pi\}$
D-A	$a_2 \approx 1.5620, a_5 \approx 0.5064$ $a_1 \approx 2.9677$	$\{-1.256, 1.256\}$ $\{-\pi, -1.256\}\{1.256, \pi\}$