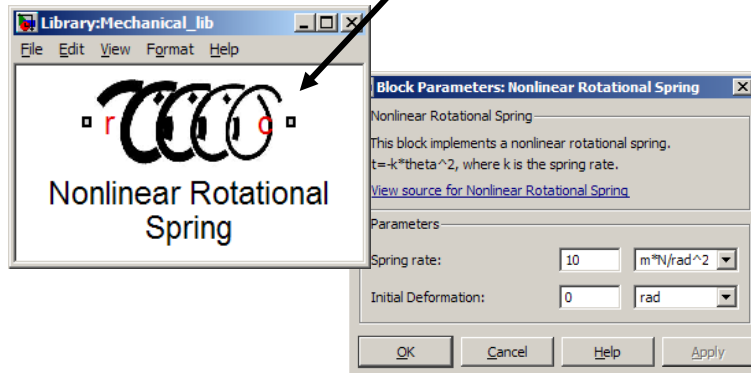


# Simscape Language: Nonlinear Spring

## Model:

$$\text{Torque} = -k\theta^2$$



**Problem:** Create a new physical modeling component for use in the Simulink environment using this equation.

**Solution:** Use the **Simscape language** to model the component.

```

Editor - C:\NonlinearRotationalSpring.ssc
File Edit Text Go Tools Debug Desktop Window Help

1 component NonlinearRotationalSpring
2 % Nonlinear Rotational Spring
3 % This block implements a nonlinear rotational spring.
4 % t=-k*theta^2, where k is the spring rate.
5
6 % Copyright 2005-2009 The MathWorks, Inc.
7
8 nodes
9     r = foundation.mechanical.rotational.rotational; % R:left
10    c = foundation.mechanical.rotational.rotational; % C:right
11 end
12 parameters
13     k = {10, 'N*m/rad^2'}; % Spring rate
14     theta0 = {0, 'rad'}; % Initial deformation
15 end
16 variables
17     t = {0, 'N*m'}; % Torque through
18     w = {0, 'rad/s'}; % Velocity across
19     theta = {0, 'rad'};
20 end
21 function setup
22     across( w, r.w, c.w );
23     through( t, r.t, c.t );
24     theta = theta0;
25     if k < 0
26         error('Spring rate must be positive');
27     end
28 end
29 equations
30     t == k * theta * theta * sign(theta);
31     w == theta.der;
32 end
33 end
    
```

- ✓ MATLAB based
- ✓ Object-oriented
- ✓ Define implicit equations (DAEs and ODEs)