
```

function [xs ys] = spring(xa,ya,xb,yb,varargin)
% SPRING      Calculates the position of a 2D spring
%   [XS YS] = SPRING(XA,YA,XB,YB,NE,A,R0) calculates the position of
%   points XS, YS of a spring with ends in (XA,YA) and (XB,YB),
%   number
%   of coils equal to NE, natural length A, and natural radius R0.
%   Useful for mass-spring oscillation animations.
% USAGE: in a first call in your code, call it with the full
%   parameters.
% Then, only you have to give it the coordinates of the ends.
% EXAMPLE:
% xa = 0; ya = 0; xb = 2; yb = 2; ne = 10; a = 1; ro = 0.1;
% [xs,ys] = spring(xa,ya,xb,yb,ne,a,ro); plot(xs,ys,'LineWidth',2)
% ...
% [xs,ys]=spring(xa,ya,xb,yb); plot(xs,ys,'LineWidth',2)
%
%   Made by:          Gustavo Morales    UC    08-17-09
%   gmorales@uc.edu.ve
%
persistent ne Li_2 ei b
if nargin > 4 % calculating some fixed spring parameters only once
    time
        [ne a r0] = varargin{1:3}; % ne: number of coils
        - a = natural length - r0 = natural radius
        Li_2 = (a/(4*ne))^2 + r0^2; % (large of a quarter
of coil)^2
        ei = 0:(2*ne+1); % vector of
longitudinal positions
        j = 0:2*ne-1; b = [0 (-ones(1,2*ne)).^j 0]; % vector of
transversal positions
end
R = [xb yb] - [xa ya]; mod_R = norm(R); % relative position between
"end_B" and "end_A"
L_2 = (mod_R/(4*ne))^2; % (actual longitudinal extensión of a coil )^2
if L_2 > Li_2
    error('Spring:TooEnlargement', ...
        'Initial conditions cause pulling the spring beyond its maximum
large. \n Try reducing these conditions.')
else
    r = sqrt(Li_2 - L_2); %actual radius
end
c = r*b; % vector of transversal positions
u1 = R/mod_R; u2 = [-u1(2) u1(1)]; % unitary longitudinal and
transversal vectors
xs = xa + u1(1)*(mod_R/(2*ne+1)).*ei + u2(1)*c; % horizontal
coordinates
ys = ya + u1(2)*(mod_R/(2*ne+1)).*ei + u2(2)*c; % vertical coordinates
Not enough input arguments.

Error in spring (line 24)
R = [xb yb] - [xa ya]; mod_R = norm(R); % relative position between
"end_B" and "end_A"

```

Published with MATLAB® R2017a