A Design Study Approach to Classical Control

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Homework D.a

Create a simulink animation of the mass-spring-damper system. The input should be a slider for z. Turn in a screen capture of the animation.

Solution

The drawing function for the mass spring damper is listed below.

```
function drawMSD(u, P)

    % process inputs to function
    z         = u(1);
    %zdot     = u(2);
    t         = u(3);

    % define persistent variables
    persistent mass_handle
    persistent spring_handle

    % first time function is called, initialize plot and persistent
    % vars
    if t==0
        figure(1), clf
        plot([-P.length-P.length/5,2*P.length],[0,0],'k--'); % plot track
        hold on
        plot([-P.length, -P.length], [0, 2*P.width],'k'); % plot wall
```

```
19          mass_handle = drawMass(z, P.width, P.length, []);
20          spring_handle = drawSpring(z, P.width, P.length, []);
21          axis([-P.length-P.length/5, 2*P.length, -P.length, 2*P.length]);
22
23      % at every other time step, redraw base and rod
24      else
25          drawMass(z, P.width, P.length, mass_handle);
26          drawSpring(z, P.width, P.length, spring_handle);
27          drawnow
28      end
29  end
30
31
32  %
33  %=======================================================================
34  % drawMass
35  % draw the mass
36  % return handle if 3rd argument is empty, otherwise use 3rd arg as
37  % handle
38  %=======================================================================
39  function handle = drawMass(z, w, L, handle)
40
41    X = [z-w/2, z+w/2, z+w/2, z-w/2];
42    Y = [0, 0, w, w];
43
44    if isempty(handle),
45      handle = fill(X,Y,'b');
46    else
47      set(handle,'XData',X,'YData',Y);
48    end
49  end
50
51  %
52  %=======================================================================
53  % drawSpring
54  % draw the cord
55  % return handle if 3rd argument is empty, otherwise use 3rd arg as
56  % handle
57  %=======================================================================
58  function handle = drawSpring(z, w, L, handle)
59
60    X = [-L, z-w/2];
61    Y = [w/2, w/2];
62
63    if isempty(handle),
```

```
64      handle = plot(X, Y, 'g');
65    else
66      set(handle,'XData',X,'YData',Y);
67    end
68  end
```

The complete solution is given on the wiki associated with the book.