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Programming Homework 1 - (Aidan Murray)

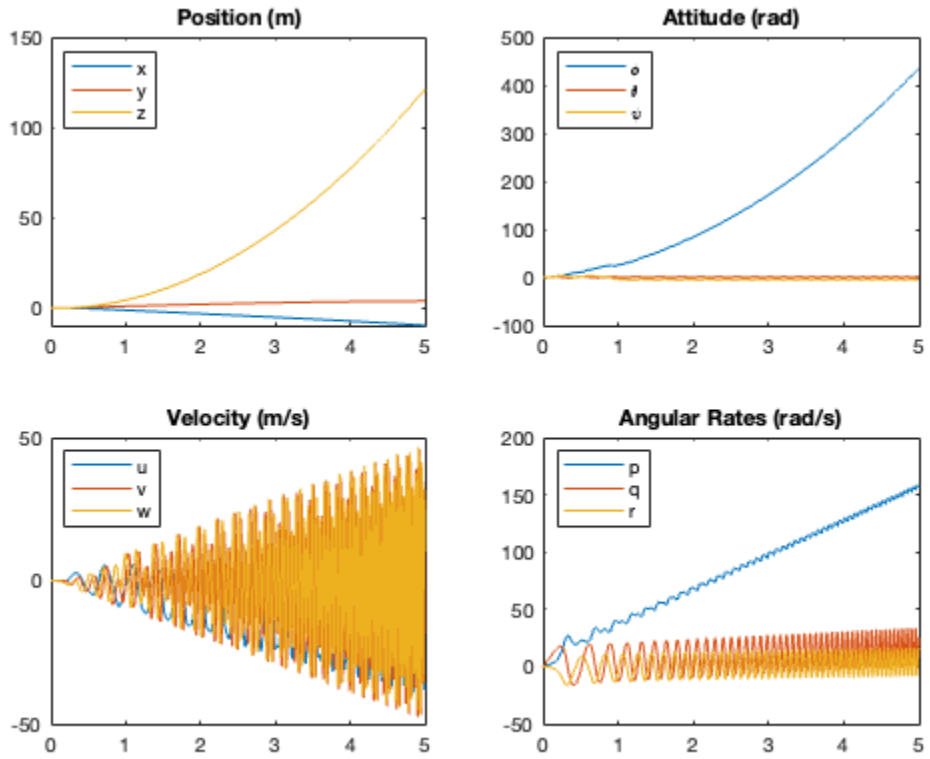
```
clear; close all; clc;
```

Task 5

```
u = [2.3];
[tout, xout] = ode45(@(t,x) monospinnerDynamics(t, x, u), [0 5], zeros(12,
1));

plotStateHistory(tout, xout);

% Answer to Task 5:
% Initially, the angular rate q grows the fastest. This is becuase
% when the mono spinner starts up the thrust from the prop immediatly
% causes the aircraft to increase in pitch.
```



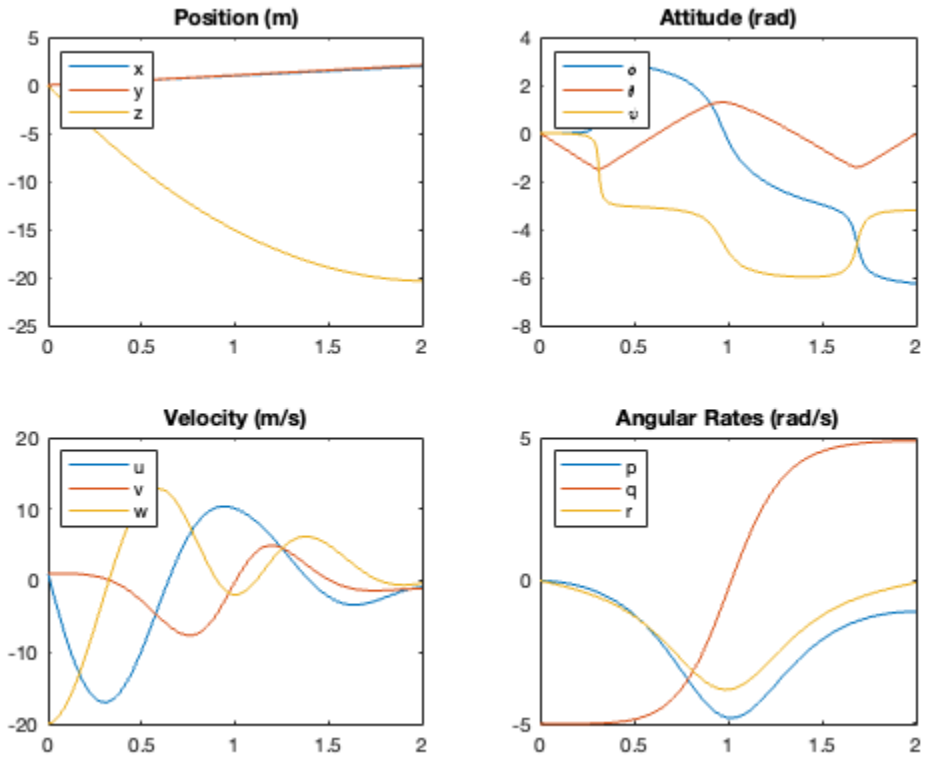
Task 6

```
u = [0.0];
X0 = [0; 0; 0;   % Position
      0; 0; 0;   % Orientation
      1; 1; -20; % Velocity
      0; -5; 0]; % Angular Rate

[tout, xout] = ode45(@(t,x) monospinnerDynamics(t, x, u), [0 2], X0);

plotStateHistory(tout, xout);

% Answer to Task 6:
% The term w oscillates because the monocopter is rotating as it is thrown
% upwards as well as as it comes back down. Since it starts with a negative
% angular rate through q, it puts the mono spinner into a spiral for the
% duration of the 'flight'. If we set the intial q to 0 we can see that
% all angular rates are constant at 0.
```



Task 7

Answer to Task 7: In real life the monospinner relies on drag for steady flight. Drag affects the aerodynamic forces in our equation for change in velocity. Even more critically, there is a grad moment that acts on the aircraft that ensures rotational stability. Both of these are fundamentally required to insure reliable flights.

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