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% Script for 2011 ME227 Homework Assignment 1 Problem 1
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% Make sure you have a clean environment in which to work
clear all
close all
clc

% Add the path to our common files that we will often recycle
addpath('../Common')

% Enumerate the wheels (this should appear in all your files)
lf = 1; rf = 2; lr = 3; rr = 4;

% First load the parameters for the vehicle you are going to use
vehicleTTS

% Define the simulation parameters for your first simulation.
% Our state variables are x = [Uy r]' where Uy = lateral velocity,
% Define the initial conditions of the simulation


% Define testing scenario
driver.mode = 'step'; % Type of steering (control strategy or maneu
driver.delta0 = 0;  % Initial steering angle
driver.deltaf = 2*pi/180;  % Steering angle during the step
driver.steertime = 0;  % Time to start the step
simulation.speed = 20;  % Perform the maneuver at 20 m/s

% Define which models we want to use
simulation.vmodel =  'bike';  % vehicle model
simulation.tmodel =  'linear'    % tire model

% Define any convenient physical parameters
simulation.g = 9.81;

% Initialize our time vector and state vector
t0 = 0; tf = 1; tstep = 0.001;
t = t0:tstep:tf;
x = zeros((tf - t0) / tstep + 1,2);

% Euler integration
for i = 1:(size(t,2) - 1)
    delta = steering(simulation, driver, x(i,:), t(i));
    alpha = slips(simulation, vehicle, x(i,:), delta);
    Fy = tireforces(simulation, vehicle, alpha);
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    dxdt = derivs(simulation, vehicle, x(i,:), Fy);
    x(i+1,:) = x(i,:) + tstep*dxdt;
end
```

```
simulation =

     speed: 20
    vmodel: 'bike'
    tmodel: 'linear'
```

Display results

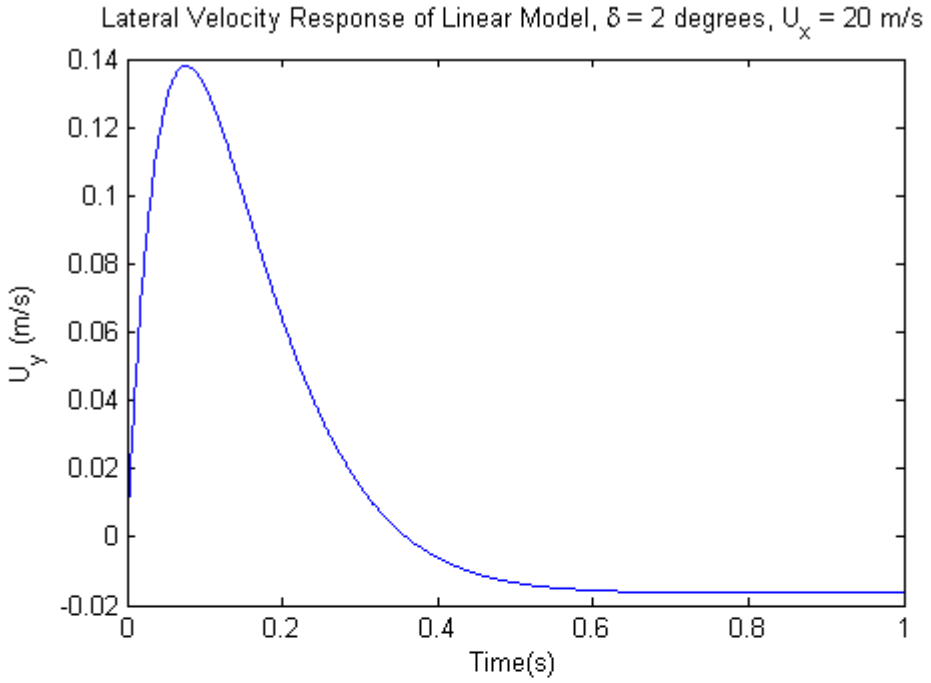
```
figure;
set(gcf, 'position', [100 0 500 800]);
subplot(211); plot(t,x(:,1));
title('Lateral Velocity Response of Linear Model, \delta = 2 degree
xlabel('Time(s)'); ylabel('U_y (m/s)');
subplot(212); plot(t,x(:,2));
title('Yaw Rate Response of Linear Model, \delta = 2 degrees, U_x =
xlabel('Time(s)'); ylabel('U_y (m/s)')
Uy_ss = x(end,1)
r_ss = x(end,2)
```

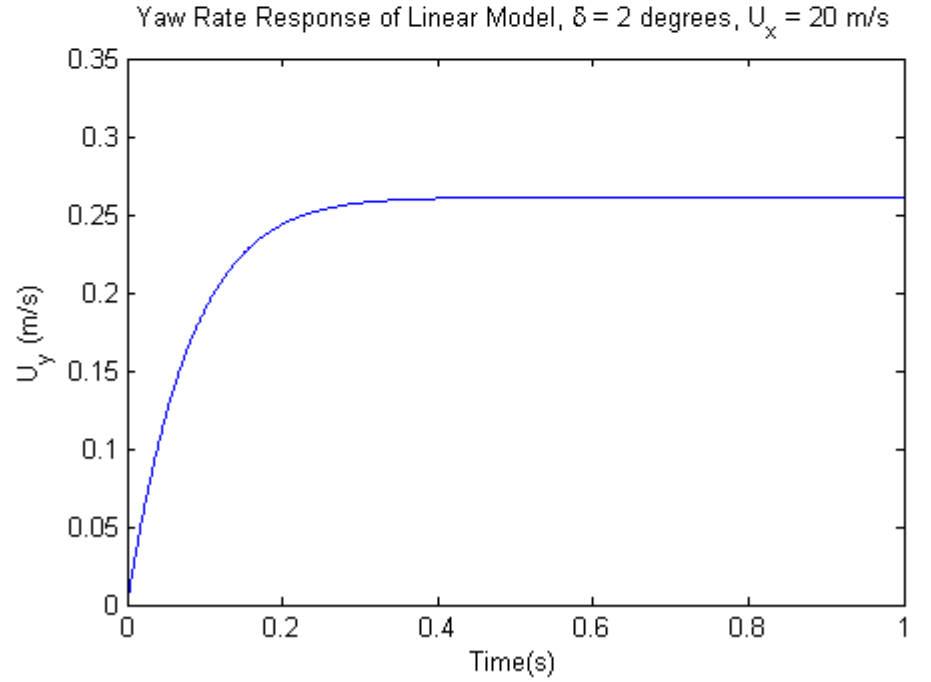
```
Uy_ss =

   -0.0164


r_ss =

    0.2606
```


Lateral Velocity Response of Linear Model, δ = 2 degrees, U_x = 20 m/s
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
U_y (m/s)
0
0.2
0.4
0.6
0.8
1
Time(s)


Yaw Rate Response of Linear Model, δ = 2 degrees, U_x = 20 m/s
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
U_y (m/s)
0
0.2
0.4
0.6
0.8
1
Time(s)

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