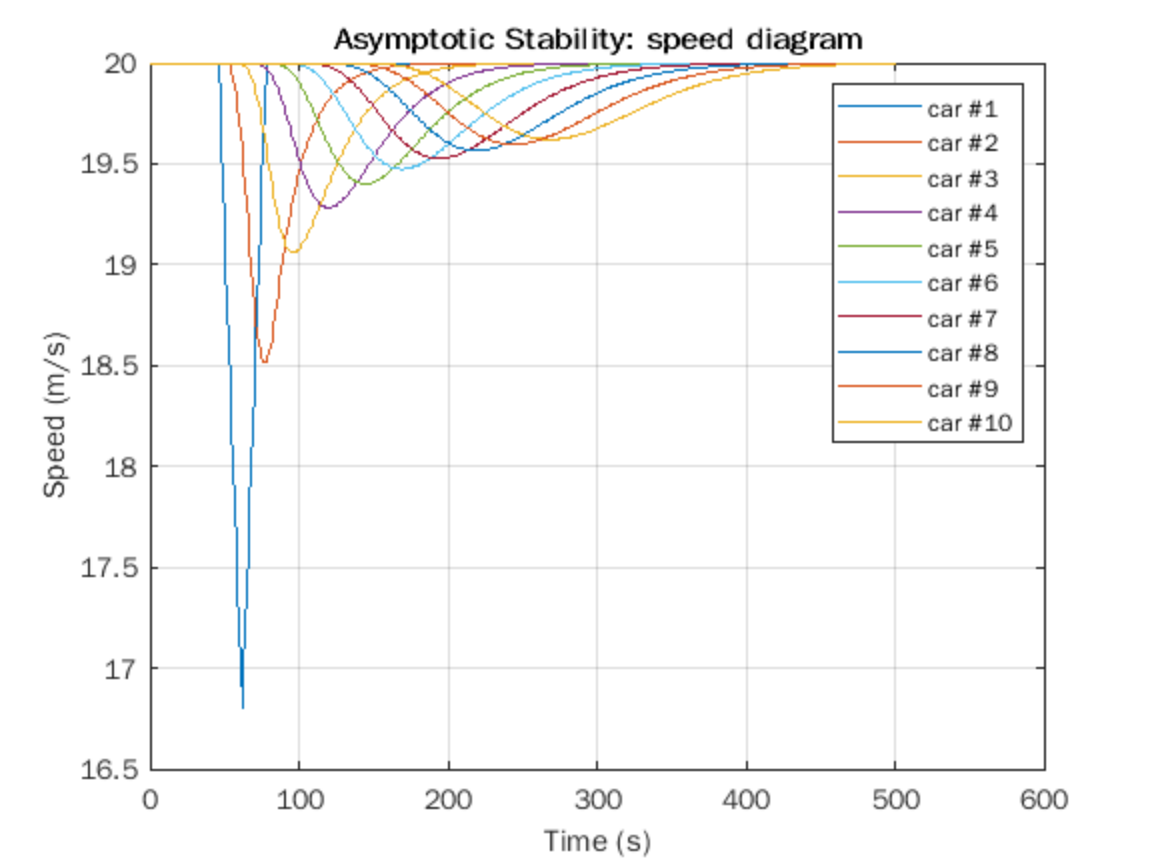
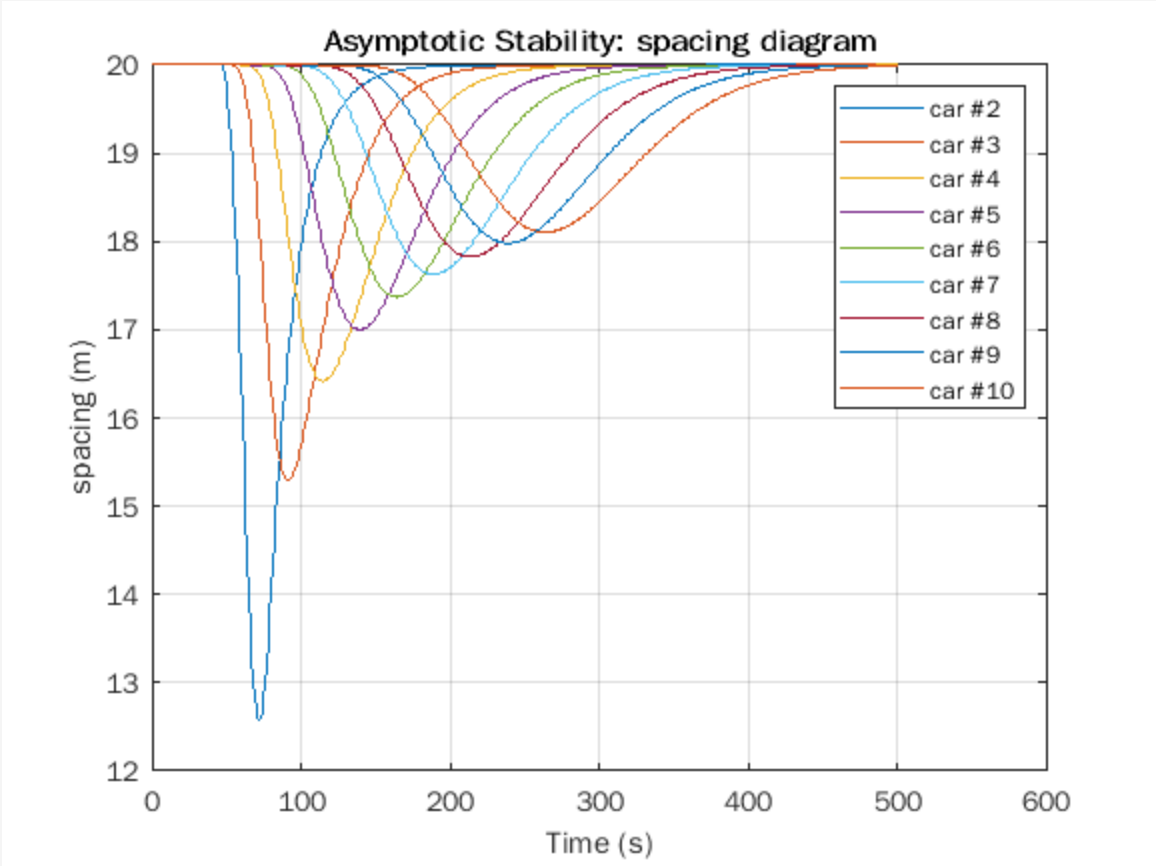
```
clc
clear all
%% Exercise: simulation of car following platoon
%introduceing all variables
%DT: Time interval duration
%dt: Time step
%n : Number of vehicles to simulate (number n of equation of the system): n=10
cars
%sp :speed is equals to 20 m/s for all vehicles
%Ac :acceleration is equal to zero for all vehicles
%T:time between 0 and 100
%d: distance ,first distance is 0


DT=50 ; dt=0.2; n=10; sp(1,1)=20; T=(0:0.2:100)'; d(1,1)=0;


%% First car
Ac(:,1)=zeros(1,length(T)); %acceleration of first
Ac(46:61)=-1; % break time
Ac(62:77)=1; %accelerates


for i=1:length(T)-1
    sp(i+1,1)=sp(i,1)+Ac(i,1)*dt;  %coloumn of spped
    d(i+1,1)=d(i,1)+sp(i,1)*dt;  %couloumn of distance
end


% all cars except first
for j=2:n
    i=-20;
    d(1,j)=d(1,j-1)+i;
    sp(1,j)=sp(1,j-1);
    Ac(1,j)=Ac(1,j-1);
end


%RT: Reaction times in 3 times
RT=5
RT = 5
for j=2:n
    for i=2:RT
        sp(i,j)=sp(i-1,j)+Ac(i-1,j)*dt;
        d(i,j)=d(i-1,j)+sp(i-1,j)*dt;
    end
end
```

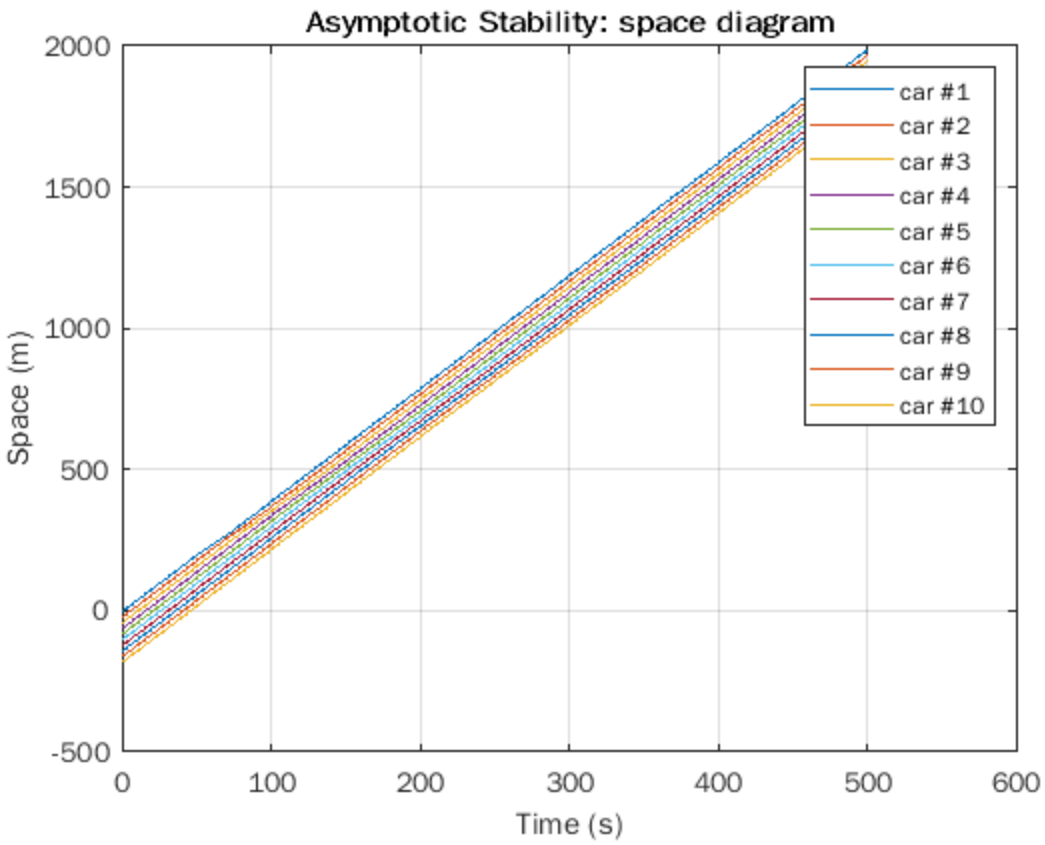
```
for j=2:n
    for i=RT+1:length(T)
        sp(i,j)=sp(i-1,j)+Ac(i-1,j)*dt;
        Ac(i,j)=dt*(sp(i-5,j-1)-sp(i-5,j));
        d(i,j)=d(i-1,j)+sp(i-1,j)*dt;
    end
end


spacing_time=zeros(length(T),n-1);
for i=1:length(T)
    for j=1:n-1
        spacing_time(i,j)=d(i,j)-d(i,j+1);
    end
end


%% Plot: speed diagram
plot(sp)
xlabel('Time (s)')
ylabel('Speed (m/s)')
title('Asymptotic Stability: speed diagram')
legend('car #1','car #2','car #3','car #4','car #5','car #6','car #7','car
#8','car #9','car #10')
grid on
```




```
%% Plot: spacing diagram
plot(spacing_time)
xlabel('Time (s)')
ylabel('spacing (m)')
title('Asymptotic Stability: spacing diagram')
legend('car #2','car #3','car #4','car #5','car #6','car #7','car #8','car
#9','car #10')
grid on
```




```
%% Plot: spacing diagram
plot(d)
xlabel('Time (s)')
ylabel('Space (m)')
title('Asymptotic Stability: space diagram')
legend('car #1','car #2','car #3','car #4','car #5','car #6','car #7','car
#8','car #9','car #10')
grid on
```


Asymptotic Stability: space diagram
Space (m)
Time (s)
2000
1500
1000
500
0
-500
0
100
200
300
400
500
600
car #1
car #2
car #3
car #4
car #5
car #6
car #7
car #8
car #9
car #10