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Lab 10 Least Squares and Dynamic Systems

**Paste your LS\_estimation.m function**

function [x,t0] = LS\_estimation(A,b)

N = 100;

x = ones(3,N);

x(:,1) = b;

for i = 2:N

x(:,i) = (A' \* A)^(-1) \* A' \* b;

b = x(:,i);

end

t0 = (A' \* A)^(-1) \* A' \* b;

x=fliplr(x);

end

**Show your estimated a[0], v[0] and p[0] without noise**

Estimated without Noise

p[0]: 10.005

v[0]: -0.1

a[0]: 1

**Paste your plot MATLAB script (.m file) in question 1.3**

Data = load('Lab10\_data');

A = [1 0.1 0.005;0 1 0.1;0 0 1];

b = [Data.p\_without\_noise(100,2);9.9;1];

[x,t0] = LS\_estimation(A,b);

figure

plot(Data.p\_without\_noise(:,2), '-\*','DisplayName','Original Data')

hold on

plot(x(1,:),'DisplayName','Estimated Position')

xlabel('Time Index')

ylabel('Position')

title('Position for Without Noise')

hold off

legend

fprintf('Estimated without Noise');

fprintf('\n')

fprintf(['p[0]: ',num2str(t0(1))]);

fprintf('\n')

fprintf(['v[0]: ',num2str(t0(2))]);

fprintf('\n')

fprintf(['a[0]: ',num2str(t0(3))]);

fprintf('\n')

fprintf('\n')

**Paste your plots from question 1.3**



**Show your estimated a[0], v[0] and p[0] with noise**

Estimated with Noise

p[0]: 19.9664

v[0]: -0.1

a[0]: 1

**Paste your plot MATLAB script (.m file) in question 2.2**

A = [1 0.1 0.005;0 1 0.1;0 0 1];

b = [Data.p\_with\_noise(100,2);9.9;1];

[x,t0] = LS\_estimation(A,b);

figure

plot(Data.p\_with\_noise(:,2),'-\*','DisplayName','Original Data')

hold on

plot(x(1,:),'DisplayName','Estimated Position')

xlabel('Time Index')

ylabel('Position')

title('Position for With Noise')

legend

hold off

fprintf('Estimated with Noise');

fprintf('\n')

fprintf(['p[0]: ',num2str(t0(1))]);

fprintf('\n')

fprintf(['v[0]: ',num2str(t0(2))]);

fprintf('\n')

fprintf(['a[0]: ',num2str(t0(3))]);

fprintf('\n')

**Paste your plots from question 2.2**

