% The formulation of MPC is stored in this function

% This file will be called for every control move.

% It gives the Us for the next few times

function dy = mpcform(u,x,ys)

p = 10;

M = 10;

AB = [0.9778 0.0015 0.0001 -0.0002 0.0013;

-0.0457 1.0056 0.0113 0.0084 -0.0059;

0.2391 -0.1220 0.8773 -0.0876 -0.1704;

-0.0619 -0.0554 -0.6944 0.4586 -0.5093;

-0.0993 0.0747 0.2281 0.1980 -0.5062;];

B =[0.0001 -0.0003;

0.0055 -0.0002;

-0.2194 -0.0123;

-1.0933 -0.0700;

-0.8256 -0.0531;];

x1 = zeros(p+1,5);

x1(1,:) = x;

uu = ones(p+1,1);

uu(1) = 10;

for i = 1:(p+1)

% keyboard

x1(i+1,:) = AB\*transpose(x1(i,:)) + B\*transpose(u(i,:));

end

dy = 0;

for i = 1:(p+1)

dy = dy + uu(i)\*(x1(i+1,:) - ys)\*transpose(x1(i+1,:) - ys) ;

end

for i = 1:(M+1)

%dy = dy + (u(i,:))\*transpose(u(i,:)) ;

end

end

clc

clear all

close all

xo = zeros(5,1) ; % The initial point

% Assumption on the first control move

u0 = rand(11,2);

% u(1,:) = 0;

AA = [0.9778 0.0015 0.0001 -0.0002 0.0013;

-0.0457 1.0056 0.0113 0.0084 -0.0059;

0.2391 -0.1220 0.8773 -0.0876 -0.1704;

-0.0619 -0.0554 -0.6944 0.4586 -0.5093;

-0.0993 0.0747 0.2281 0.1980 -0.5062;];

B =[0.0001 -0.0003;

0.0055 -0.0002;

-0.2194 -0.0123;

-1.0933 -0.0700;

-0.8256 -0.0531;];

ysp = [ 1 1 1 1 1];

%C = zeros(22,22);

%b = ones(1,22); % To validate constraints

lb = -Inf\*ones(11,2);

ub = Inf\*ones(11,2);

for j = 1:100

[m,fval] = fmincon(@(u0)mpcform(u0,xo,ysp),u0,[],[],[],[],lb,ub)

xo = AA\*xo + B\*transpose(m(1,:))

% for i = 1:10

% %xo = AA\*xo + B\*transpose(m(i,:))

% u0(i,:) = m(i+1,:);

%

% end

%

% u0(11,:) = 0;

%

end