MATLAB programming course for beginners, supported by Wagatsuma Lab@Kyutech

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Specifications and requirements

1. @Time : 2021-1-16
2. @Author : Hiroaki Wagatsuma
3. @Site : https://github.com/hirowgit/1B0_matla_optmization_course
4. @IDE : MATLAB R2018a
5. @File : A2_Object_Move_Advanced.m

Main program

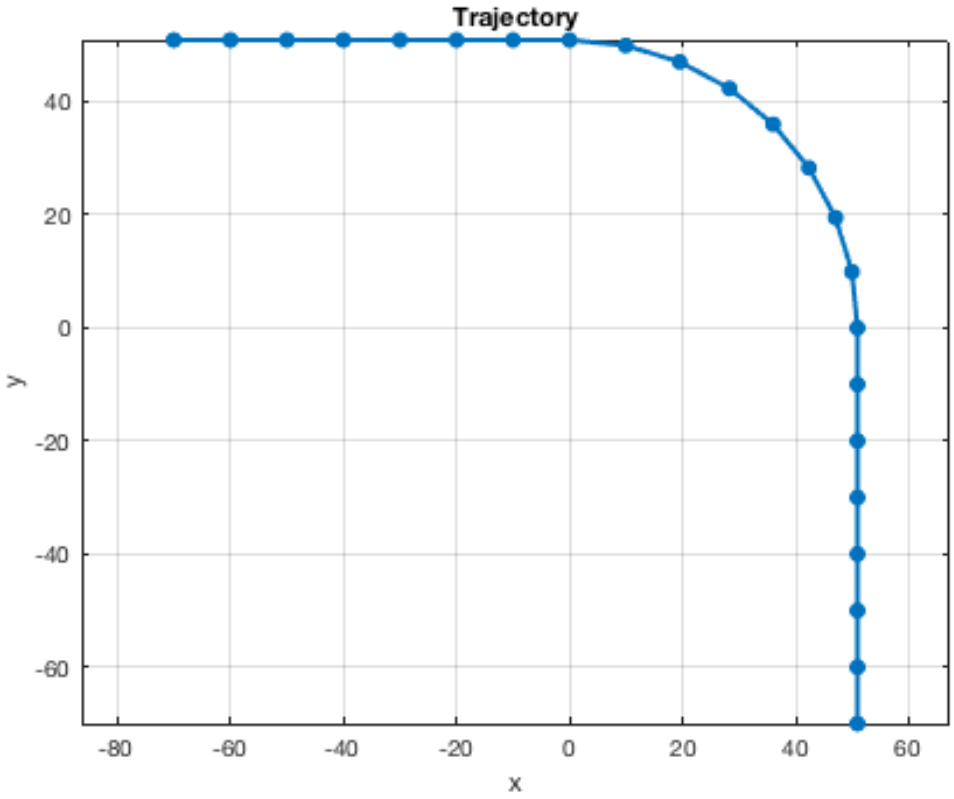
clear all

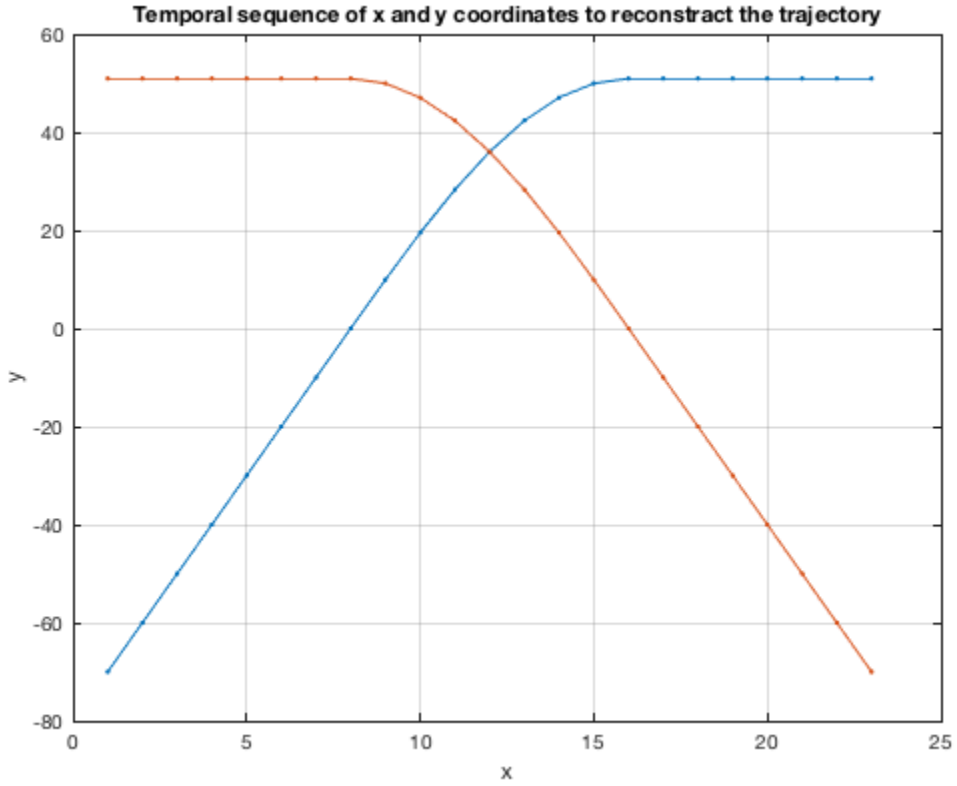
```
clc

contr=[-0.15,0.15,0.7,0.7,-0.7,-0.7,-0.15,-0.15,0.15,0.15;1,1,1,-1,-1,1,1,-1,-1,1]
gAng=@(x1,y1,x2,y2) atan2(y2-y1,x2-x1);
```

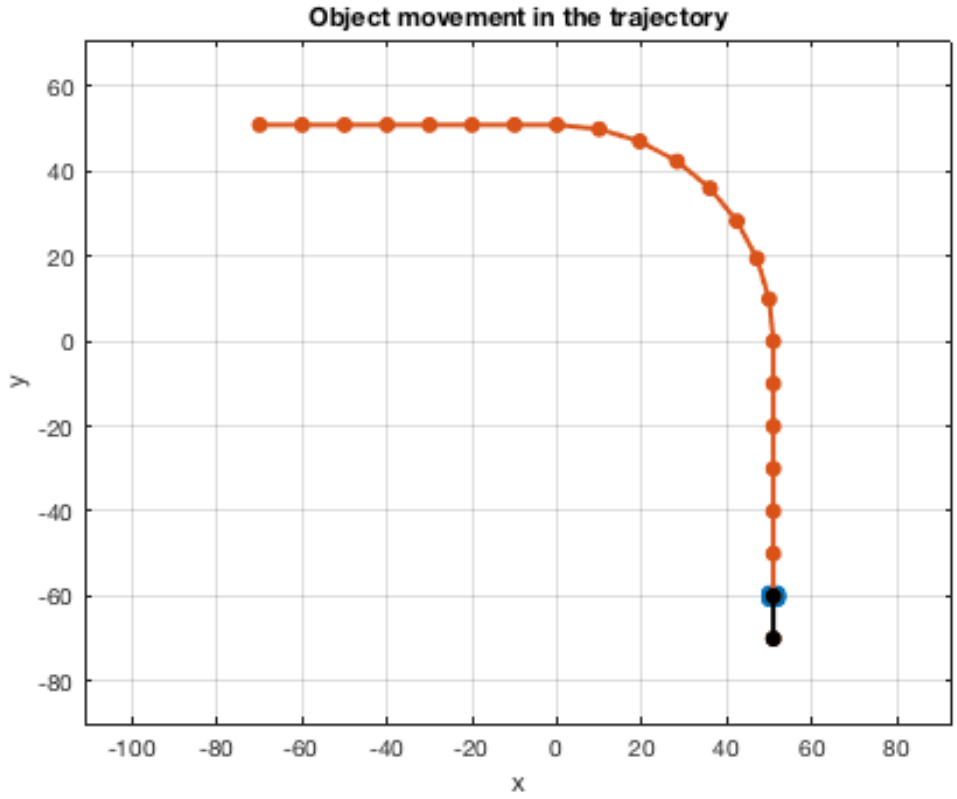
```
RotM=@(theta) [cos(theta),-sin(theta);sin(theta),cos(theta)];

% Pcontr=RotM(gAng(x1,y1,x2,y2))*contr+repmat([x1;y1],
[1,size(contr,2)]);


% ~~~~~~~~~MakeQTMovie <initialize> (start)~~~~~~~~~~~~~~
% You need to place "MakeQTMovie.m" (c) Copyright Malcolm Slaney,
 Interval Research, March 1999.
% in the same folder of this file

Flag_write_Movie=1;
Nm=1; % the serial number of the movie
f_folder='movie'; % the output folder of the movie
if ~isdir(f_folder); mkdir(f_folder); end
f_prefix='outputMovie'; % the output file name
if Flag_write_Movie == 1
    MovieFileName = strcat(f_prefix,num2str(Nm),'.mov');
    fprintf('Creating the movie file %s.\n',
 fullfile(f_folder,MovieFileName));
    MakeQTMovie('start',fullfile(f_folder,MovieFileName));
    MakeQTMovie('size', [480 360]);
    MakeQTMovie('quality', 1.0);
    fps = 10;
%   fps = 30;
end
% ~~~~~~~~~MakeQTMovie (end)~~~~~~~~~~~~~~

Ndstep=10;
Nd=7;
Radi=2*4*Ndstep/(2*pi);
Radi=4*Radi;

prange=pi/2;

dAng=prange*(Ndstep./(2*pi*Radi*(prange./(2*pi))));
% \delta \theta=R_p \cdot \frac{N_d}{2\pi r \frac{R_p}{2\pi}}\\
 R_p=prange, \\ N_d=Ndstep
tAng=0:(dAng):prange;
tAng=fliplr(tAng);

sTraj=[(Radi.*cos(tAng))' (Radi.*sin(tAng))'];
sTraj_full=sTraj;

xS=0; yS=Radi;
yPos=repmat(yS,[1,(Nd+1)]);
xPos=-(0:Ndstep:(Nd+1)*Ndstep)+xS;
sTraj=[xPos(2:Nd+1)' yPos(2:Nd+1)'];
sTraj_full=[flipud(sTraj); sTraj_full];

xS=Radi; yS=0;
xPos=repmat(xS,[1,(Nd+1)]);
yPos=-(0:Ndstep:(Nd+1)*Ndstep)+yS;
sTraj=[xPos(2:Nd+1)' yPos(2:Nd+1)'];
```

```
sTraj_full=[sTraj_full; sTraj];


figure(1); clf

plot(sTraj_full(:,1),sTraj_full(:,2),'.-','lineWidth',2,'MarkerSize',20);
axis equal;
grid on;
title('Trajectory');
xlabel('x'); ylabel('y');

figure(31);clf;
plot(sTraj_full,'.-');
grid on;
title('Temporal sequence of x and y coordinates to reconstract the
 trajectory');
xlabel('x'); ylabel('y');

figure(4); clf;

marginR=[-20 20];
for k=1:size(sTraj_full,1)-1
    x1=sTraj_full(k,1); y1=sTraj_full(k,2);
    x2=sTraj_full(k+1,1); y2=sTraj_full(k+1,2);
    Pcontr=RotM(gAng(x1,y1,x2,y2))*contr+repmat([x1;y1],
[1,size(contr,2)]);

 plot(Pcontr(1,:),Pcontr(2,:),'.-','lineWidth',2,'MarkerSize',20),hold on;

    set(gca,'xlim',[min(sTraj_full(:,1))
 max(sTraj_full(:,1))]+marginR,'ylim',[min(sTraj_full(:,2))
 max(sTraj_full(:,2))]+marginR);

 plot(sTraj_full(:,1),sTraj_full(:,2),'.-','lineWidth',2,'MarkerSize',20);
    plot([x1,x2],[y1,y2],'k.-','lineWidth',2,'MarkerSize',20);
    axis equal; grid on; xlabel('x'); ylabel('y');
    title('Object movement in the trajectory');

    % ~~~~~~~~~MakeQTMovie <add a frame> (start)~~~~~~~~~~~~~~
    if Flag_write_Movie == 1
        MakeQTMovie('addfigure');
    end
    % ~~~~~~~~~MakeQTMovie (end)~~~~~~~~~~~~~~

%     pause(0.2);
%     drawnow;
    hold off
end

% ~~~~~~~~~MakeQTMovie  <finalize> (start)~~~~~~~~~~~~~~
if Flag_write_Movie == 1
    MakeQTMovie('framerate', fps);
    MakeQTMovie('finish');
end
```

```
% ~~~~~~~~~MakeQTMovie (end)~~~~~~~~~~~~~~

strMessage=sprintf('Please find the generated mov file in the folder
 "%s" as filename "%s"',f_folder,MovieFileName);
disp(strMessage);


% ~~~~~~~~~MakeQTMovie <comment>~~~~~~~~~~~~~~
% The generated mov file is recommended to open QuickTime Player 7 in
 the first place and resave a new mov file by the player.
% The new mov file generated by the player can be opened with a recent
 version of the QuickTime Player.

% ~~~~~~~~~MakeQTMovie (end)~~~~~~~~~~~~~~

Creating the movie file movie/outputMovie1.mov.
Please find the generated mov file in the folder "movie" as filename
 "outputMovie1.mov"
```


Trajectory
40
20
0
-20
-40
-60
y
-80
-60
-40
-20
0
20
40
60
x


Temporal sequence of x and y coordinates to reconstract the trajectory
60
40
20
0
-20
-40
-60
-80
y
0
5
10
15
20
25
x



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