
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_Plus.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)]);

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

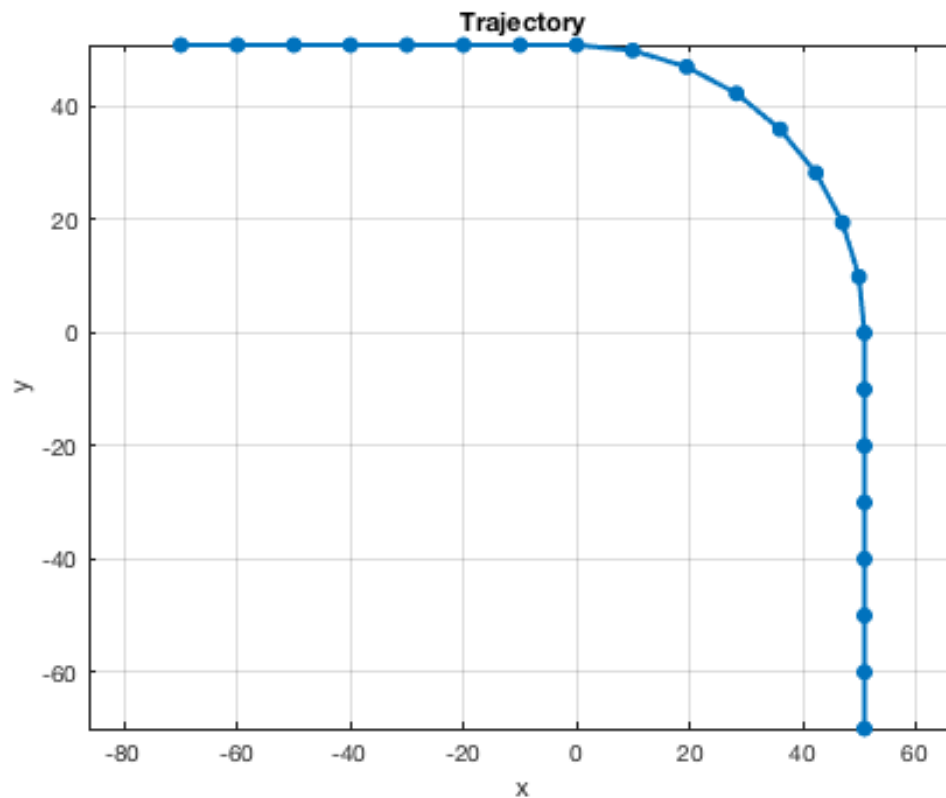
plot(sTraj_full(:,1),sTraj_full(:,2),'.-','lineWidth',2,'MarkerSize',20);
axis equal;
grid on;
title('Trajectory');
xlabel('x'); ylabel('y');

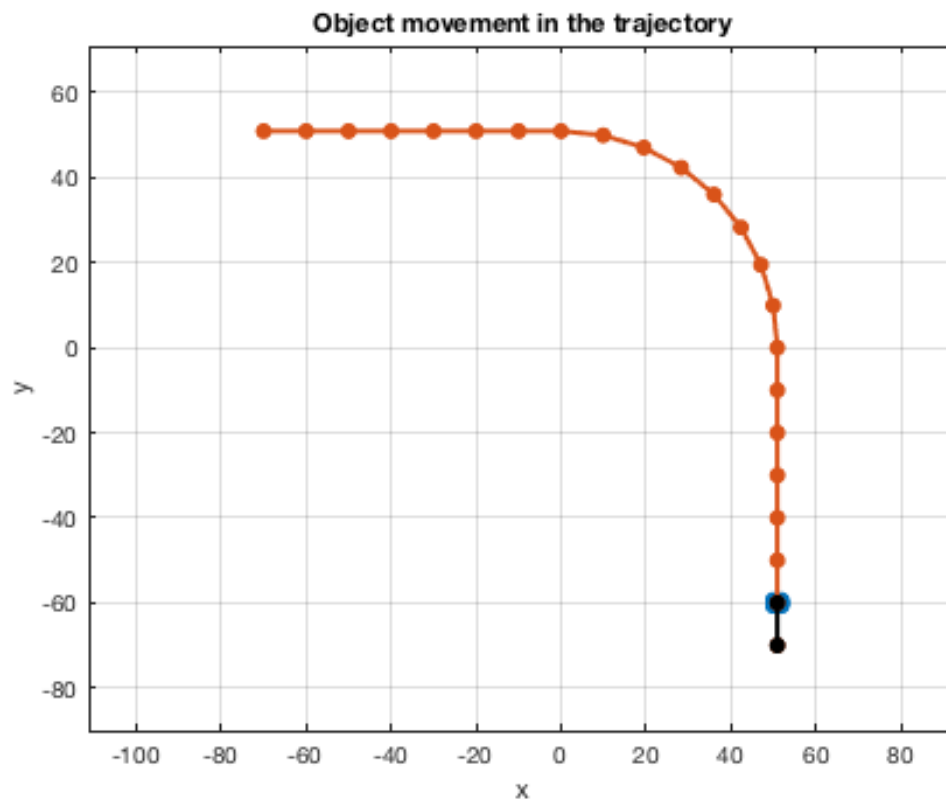
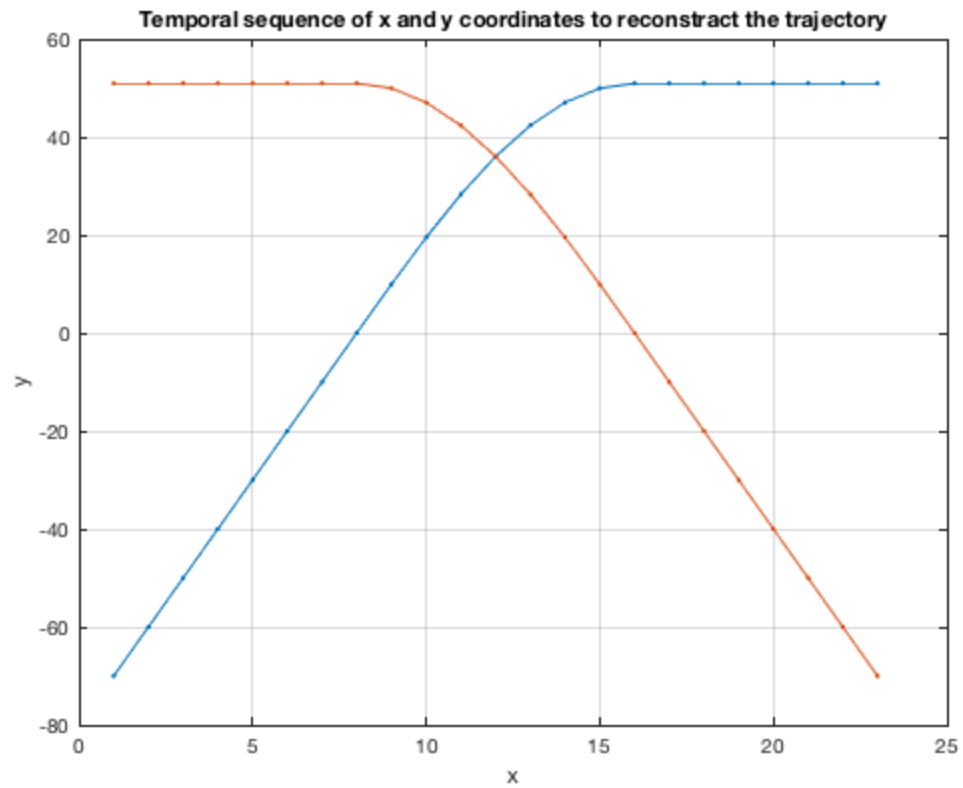
figure(31);clf;
plot(sTraj_full,'.-');
grid on;
title('Temporal sequence of x and y coordinates to reconstruct the
trajectory');
xlabel('x'); ylabel('y');

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');  
pause(0.2);  
drawnow;  
hold off  
end
```





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