
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 : A3_Objects_and_Path_Advanced.m

Main program

```
clear all

clc

A1_ExcelRead_and_Plot_Normal;
```

```

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='outputMoviePathM_k_'; % 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)~~~~~

xRange=[50 200];
yRange=[50 200];
cmap1=colormap('Lines');

figure(4); clf
Dlen=[];
for i=1:Lsize
    sTraj_full=lineD2{i};
    Dlen(i)=length(sTraj_full);
%
    pp0{i}=plot(sTraj_full(:,1),sTraj_full(:,2),'.-','lineWidth',2,'MarkerSize',20);
    hold on;
    pp0{i}=plot(sTraj_full(:,1),sTraj_full(:,2),'k-'); hold on;
    axis equal; grid on; xlabel('x'); ylabel('y');
    grid on;
    title(['Object movements in the trajectory ']);

    xx=1:size(contr,2);
    pp1{i}=plot(xx,xx,'Color',cmap1(i,:), 'lineWidth',2);
%     set(pp{i}, 'erasemode', 'xor');

    set(gca, 'xlim', xRange, 'ylim', yRange);
end
Dlim=min(Dlen);

```

```
for k=1:Dlim-1

    for i=1:Lsize
        sTraj_full=lineD2{i};
        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)]);

        set(pp1{i},'XData',Pcontr(1,:),'YData',Pcontr(2,:));
    %
    plot(Pcontr(1,:),Pcontr(2,:),'.-','lineWidth',2,'MarkerSize',20),hold
on;

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

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

% ~~~~~~MakeQTMovie <finalize> (start)~~~~~
if Flag_write_Movie == 1
    MakeQTMovie('framerate', fps);
    MakeQTMovie('finish');
    strMessage=sprintf('Please find the generated mov file in the
folder "%s" as filename "%s"',f_folder,MovieFileName);
    disp(strMessage);
end
% ~~~~~~MakeQTMovie (end)~~~~~

% ~~~~~~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)~~~~~

ans =

    struct with fields:
```

```
Description: ''
UserData: []
DimensionNames: {'Row' 'Variables'}
VariableNames: {1x9 cell}
VariableDescriptions: {}
VariableUnits: {}
VariableContinuity: []
RowNames: {}

ans =

    202     9

varnames =

    1x9 cell array

    Columns 1 through 7

        {'Var1'}    {'x1'}    {'y1'}    {'x2'}    {'y2'}    {'x3'}
{'y3'}

    Columns 8 through 9

        {'x4'}    {'y4'}

x1 =

    72.0000
    72.0000
    72.0000
    73.0141
    74.0282
    75.0423
    76.0563
    77.0704
    78.0845
    79.0986
    80.1127
    81.1268
    82.1408
    83.1549
    84.1690
    85.1831
    86.1972
    87.2113
    88.2254
    89.2394
    90.2535
    91.2676
    92.2817
```

93.2958
94.3099
95.3239
96.3380
97.3521
98.3662
99.3803
100.3944
101.4085
102.4225
103.4366
104.4507
105.4648
106.4789
107.4930
108.5070
109.5211
110.5352
111.5493
112.5634
113.5775
114.5915
115.6056
116.6197
117.6338
118.6479
119.6620
120.6761
121.6901
122.7042
123.7183
124.7324
125.7465
126.7606
127.7746
128.7887
129.8028
130.8169
131.8310
132.8451
133.8592
134.8732
135.8873
136.9014
137.9155
138.9296
139.9437
140.9577
141.9718
142.9859
144.0000
144.0000
144.0727
144.2853

144.6296
145.0974
145.6804
146.3704
147.1591
148.0384
149.0000
150.0357
151.1372
152.2963
153.5048
154.7545
156.0370
157.3443
158.6680
160.0000
161.3320
162.6557
163.9630
165.2455
166.4952
167.7037
168.8628
169.9643
171.0000
171.0000
171.9634
172.8555
173.6790
174.4367
175.1312
175.7654
176.3420
176.8637
177.3333
177.7535
178.1271
178.4568
178.7453
178.9954
179.2099
179.3914
179.5428
179.6667
179.7659
179.8432
179.9012
179.9428
179.9707
179.9877
179.9963
179.9995
180.0000
180.0000

55.0046
55.2547
55.5432
55.8729
56.2465
56.6667
57.1363
57.6580
58.2346
58.8688
59.5633
60.3210
61.1445
62.0366
63.0000
63.0000
64.0357
65.1372
66.2963
67.5048
68.7545
70.0370
71.3443
72.6680
74.0000
75.3320
76.6557
77.9630
79.2455
80.4952
81.7037
82.8628
83.9643
85.0000
85.9616
86.8409
87.6296
88.3196
88.9026
89.3704
89.7147
89.9273
90.0000
90.0000
91.0141
92.0282
93.0423
94.0563
95.0704
96.0845
97.0986
98.1127
99.1268
100.1408

101.1549
102.1690
103.1831
104.1972
105.2113
106.2254
107.2394
108.2535
109.2676
110.2817
111.2958
112.3099
113.3239
114.3380
115.3521
116.3662
117.3803
118.3944
119.4085
120.4225
121.4366
122.4507
123.4648
124.4789
125.4930
126.5070
127.5211
128.5352
129.5493
130.5634
131.5775
132.5915
133.6056
134.6197
135.6338
136.6479
137.6620
138.6761
139.6901
140.7042
141.7183
142.7324
143.7465
144.7606
145.7746
146.7887
147.8028
148.8169
149.8310
150.8451
151.8592
152.8732
153.8873
154.9014

```
155.9155  
156.9296  
157.9437  
158.9577  
159.9718  
160.9859  
162.0000
```

```
lineD =
```

```
1x1 cell array  
  
{202x1 double}
```

```
lineD =
```

```
1x1 cell array  
  
{202x2 double}
```

```
x2 =
```

```
72.0000  
72.0000  
72.0000  
73.0141  
74.0282  
75.0423  
76.0563  
77.0704  
78.0845  
79.0986  
80.1127  
81.1268  
82.1408  
83.1549  
84.1690  
85.1831  
86.1972  
87.2113  
88.2254  
89.2394  
90.2535  
91.2676  
92.2817  
93.2958  
94.3099  
95.3239  
96.3380  
97.3521  
98.3662
```

99.3803
100.3944
101.4085
102.4225
103.4366
104.4507
105.4648
106.4789
107.4930
108.5070
109.5211
110.5352
111.5493
112.5634
113.5775
114.5915
115.6056
116.6197
117.6338
118.6479
119.6620
120.6761
121.6901
122.7042
123.7183
124.7324
125.7465
126.7606
127.7746
128.7887
129.8028
130.8169
131.8310
132.8451
133.8592
134.8732
135.8873
136.9014
137.9155
138.9296
139.9437
140.9577
141.9718
142.9859
144.0000
144.0000
144.0916
144.3590
144.7914
145.3776
146.1067
146.9676
147.9495
149.0413


```
lineD =  
  
1x2 cell array  
  
    {202x2 double}    {202x1 double}
```

```
lineD =  
  
1x2 cell array  
  
    {202x2 double}    {202x2 double}
```

```
x3 =  
  
180.0000  
180.0000  
180.0000  
179.9722  
179.8900  
179.7553  
179.5698  
179.3354  
179.0538  
178.7269  
178.3566  
177.9445  
177.4925  
177.0025  
176.4763  
175.9155  
175.3222  
174.6981  
174.0449  
173.3646  
172.6589  
171.9296  
171.1785  
170.4076  
169.6185  
168.8131  
167.9932  
167.1606  
166.3171  
165.4645  
164.6047  
163.7395  
162.8707  
162.0000  
162.0000
```

160.5803
159.1684
157.7723
156.3998
155.0588
153.7571
152.5027
151.3034
150.1671
149.1016
148.1149
147.2148
146.4091
145.7058
145.1127
144.6377
144.2887
144.0735
144.0000
144.0000
142.9859
141.9718
140.9577
139.9437
138.9296
137.9155
136.9014
135.8873
134.8732
133.8592
132.8451
131.8310
130.8169
129.8028
128.7887
127.7746
126.7606
125.7465
124.7324
123.7183
122.7042
121.6901
120.6761
119.6620
118.6479
117.6338
116.6197
115.6056
114.5915
113.5775
112.5634
111.5493
110.5352
109.5211

0
0
0
0
0

y3 =

126.0000
126.0000
126.0000
125.1290
124.2581
123.3871
122.5161
121.6452
120.7742
119.9032
119.0323
118.1613
117.2903
116.4194
115.5484
114.6774
113.8065
112.9355
112.0645
111.1935
110.3226
109.4516
108.5806
107.7097
106.8387
105.9677
105.0968
104.2258
103.3548
102.4839
101.6129
100.7419
99.8710
99.0000
99.0000
97.6524
96.4466
95.3745
94.4285
93.6005
92.8828
92.2674
91.7465
91.3121
90.9566


```
lineD =  
  
1x3 cell array
```

{202×2 double} {202×2 double} {202×1 double}

lineD =

1×3 cell array

{202×2 double} {202×2 double} {202×2 double}

x4 =

*72.0000
72.0000
72.0000
73.0141
74.0282
75.0423
76.0563
77.0704
78.0845
79.0986
80.1127
81.1268
82.1408
83.1549
84.1690
85.1831
86.1972
87.2113
88.2254
89.2394
90.2535
91.2676
92.2817
93.2958
94.3099
95.3239
96.3380
97.3521
98.3662
99.3803
100.3944
101.4085
102.4225
103.4366
104.4507
105.4648
106.4789
107.4930
108.5070
109.5211
110.5352*

111.5493
112.5634
113.5775
114.5915
115.6056
116.6197
117.6338
118.6479
119.6620
120.6761
121.6901
122.7042
123.7183
124.7324
125.7465
126.7606
127.7746
128.7887
129.8028
130.8169
131.8310
132.8451
133.8592
134.8732
135.8873
136.9014
137.9155
138.9296
139.9437
140.9577
141.9718
142.9859
144.0000
144.0000
144.0735
144.2887
144.6377
145.1127
145.7058
146.4091
147.2148
148.1149
149.1016
150.1671
151.3034
152.5027
153.7571
155.0588
156.3998
157.7723
159.1684
160.5803
162.0000
162.0000

108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0000
108.0013
108.0105
108.0354
108.0840
108.1640
108.2834
108.4501
108.6718
108.9566
109.3121
109.7465
110.2674
110.8828
111.6005
112.4285
113.3745
114.4466
115.6524
117.0000
117.0000
117.8710
118.7419
119.6129
120.4839
121.3548
122.2258
123.0968
123.9677
124.8387
125.7097

[illegible]
$$lineD =$$

```
1x4 cell array
```

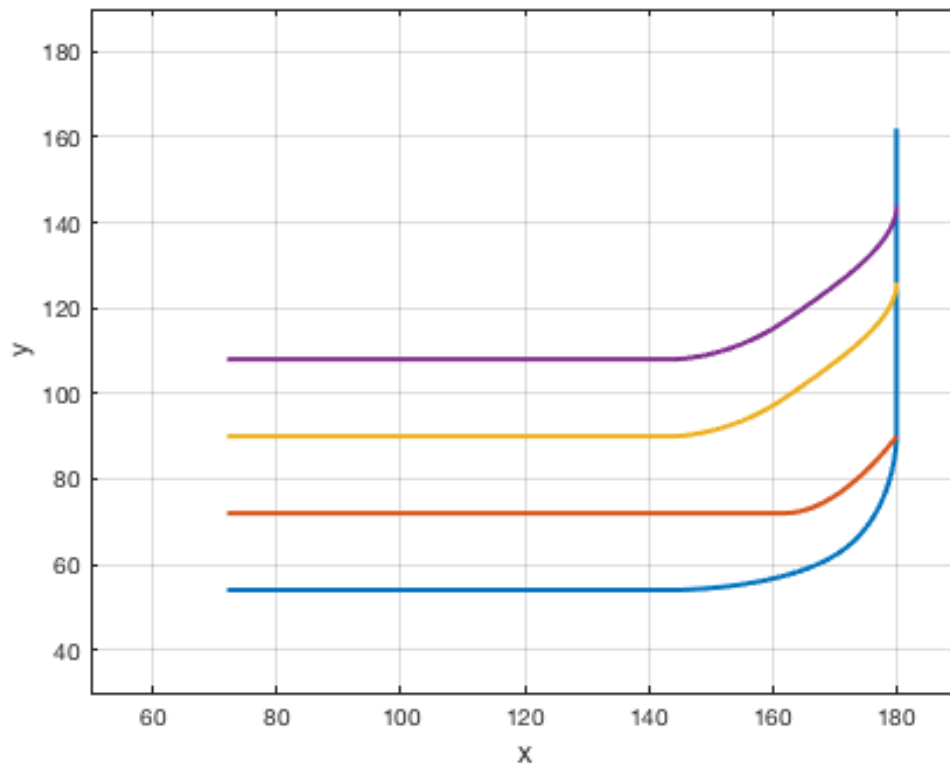
$\{202 \times 2 \text{ double}\}$	$\{202 \times 2 \text{ double}\}$	$\{202 \times 2 \text{ double}\}$	$\{202 \times 1$
$\text{double}\}$			$\text{double}\}$

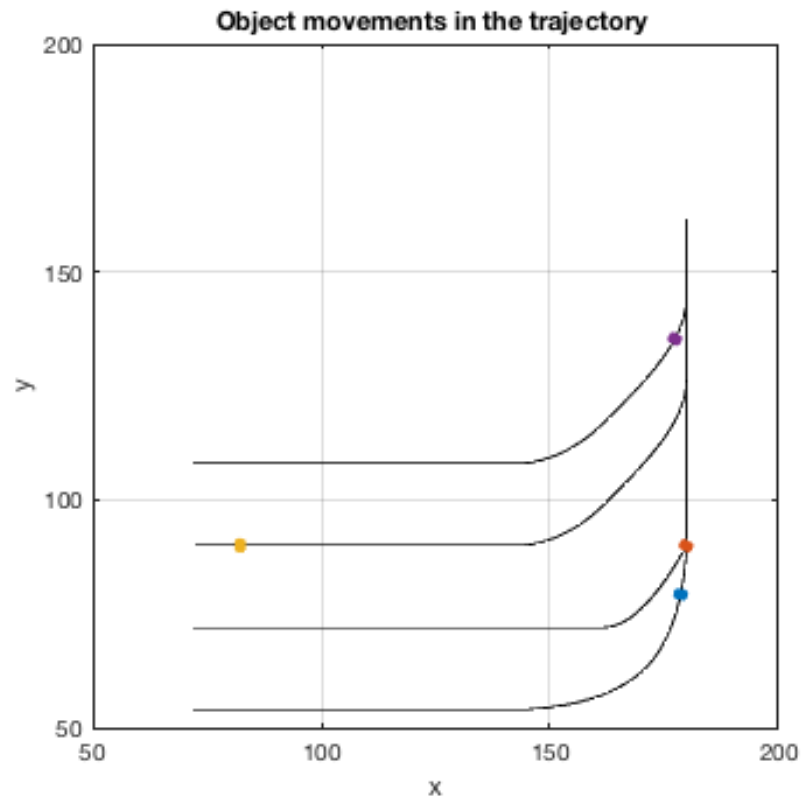
$$lineD =$$

1×4 cell array

{202×2 double} {202×2 double} {202×2 double} {202×2 double}

*Creating the movie file movie/outputMoviePathM_k_1.mov.
Please find the generated mov file in the folder "movie" as filename
"outputMoviePathM_k_1.mov"*





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