WHEEL MOBILE ROBOTS - KINEMATICS

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Assumptions:

We asume a two wheeled mobile robot along a path consisting of 5 different segments:

Startup, straight line movement, arc movement, straignt line movement, deceleration and stop.

Acceleration time: 2s

Max speed: 1m/s

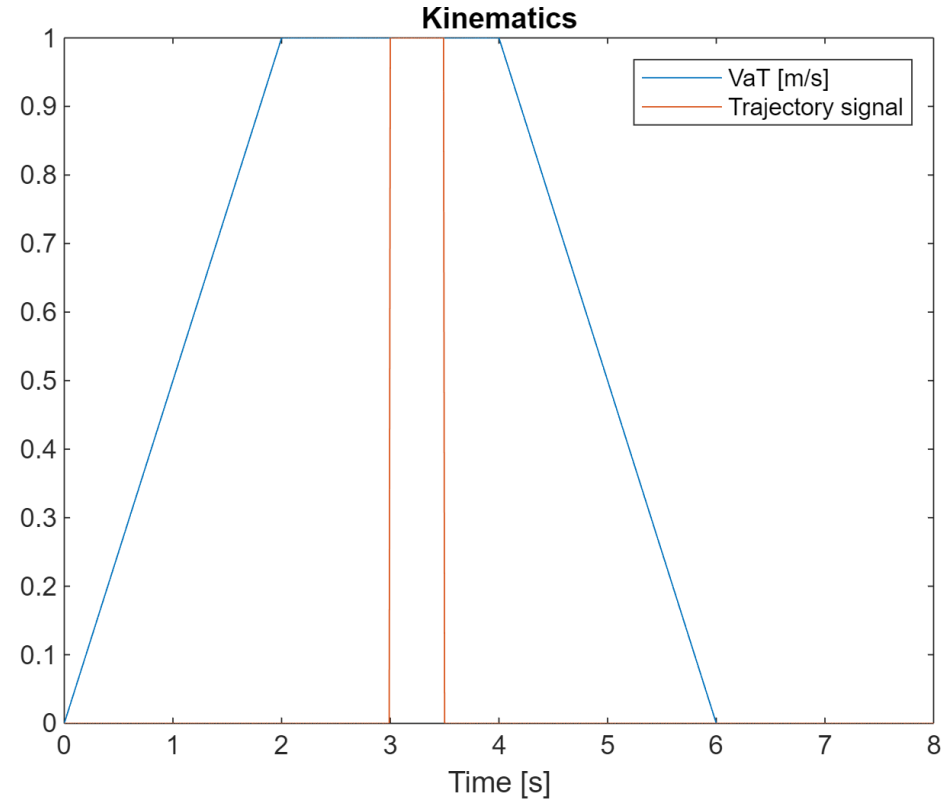
Straight line movement: 1s

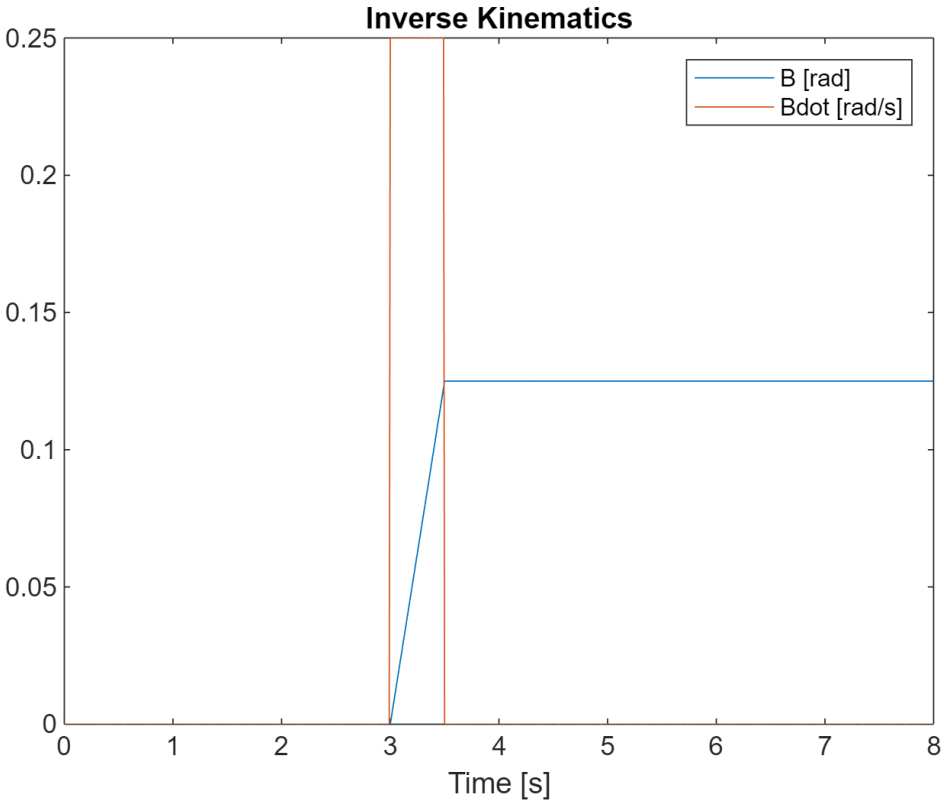
Arc movement: 0.5s R=4m

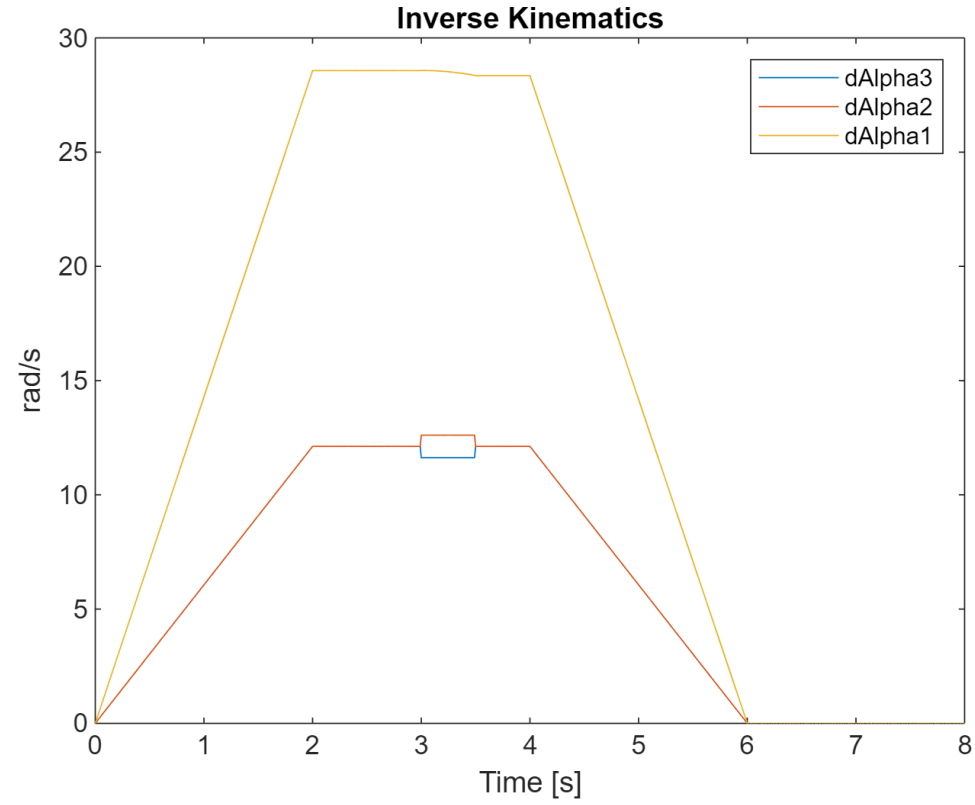
Straight line movement: 0.5s

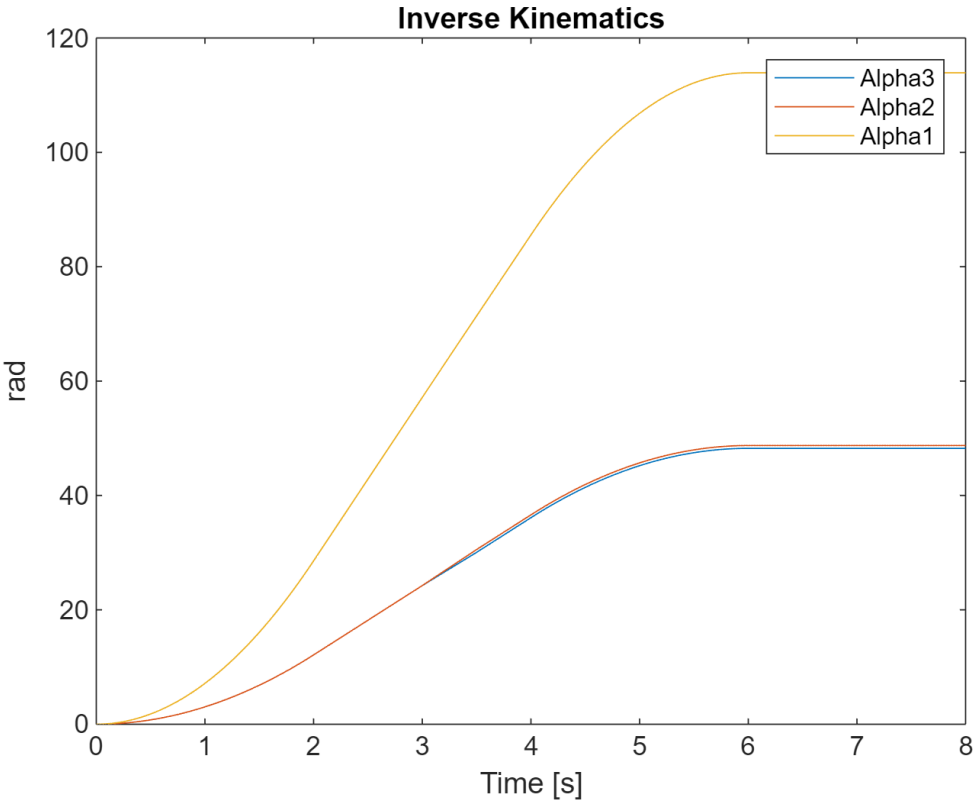
Decceleration time: 2s

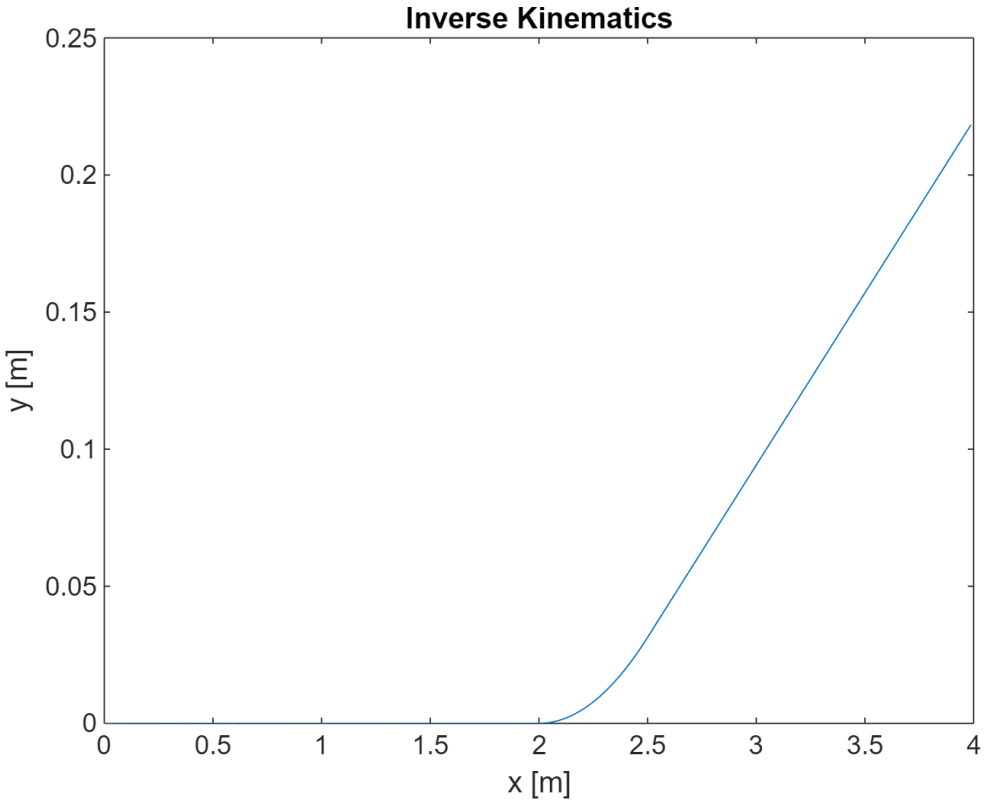
```
clear
load out.mat
dataobj=out.simout;
labPlot(dataobj)
```


Kinematics
VaT [m/s]
Trajectory signal
Time [s]


Inverse Kinematics
B [rad]
Bdot [rad/s]
Time [s]


Inverse Kinematics
dAlpha3
dAlpha2
dAlpha1
rad/s
Time [s]
0
5
10
15
20
25
30
0
1
2
3
4
5
6
7
8


Inverse Kinematics
Alpha3
Alpha2
Alpha1
rad
Time [s]
0
20
40
60
80
100
120
0
1
2
3
4
5
6
7
8



Assumptions 2:

We asume a two wheeled mobile robot along a path consisting of 5 different segments:

Startup, straight line movement, arc movement, straignt line movement, deceleration and stop.

Acceleration time: 2s

Max speed: 1m/s

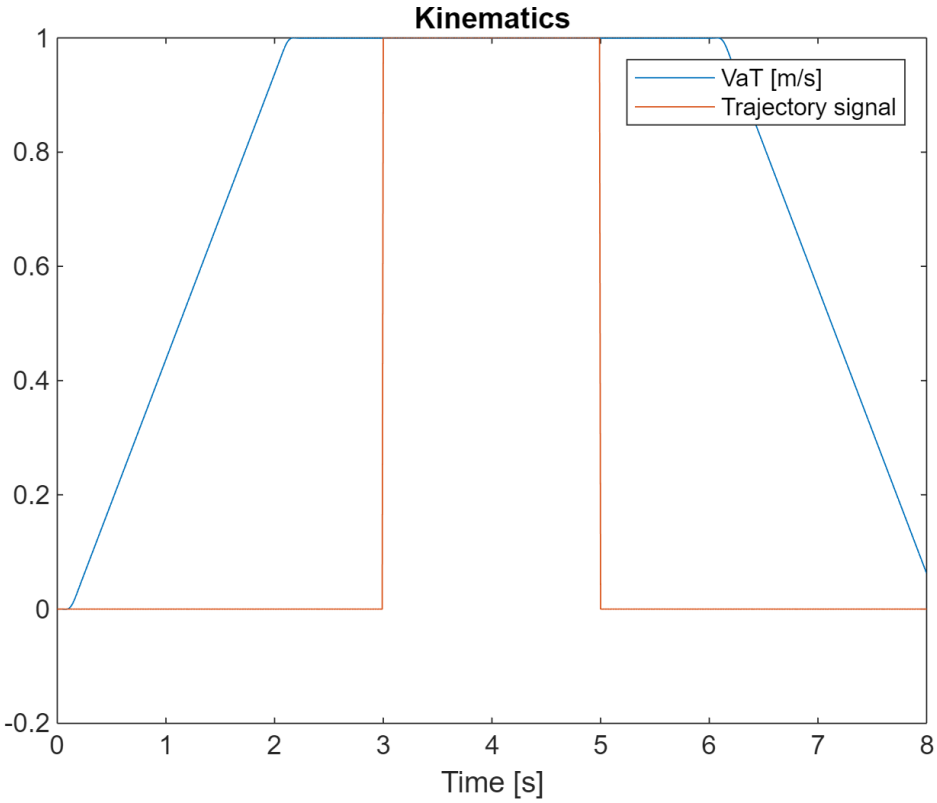
Straight line movement: 1s

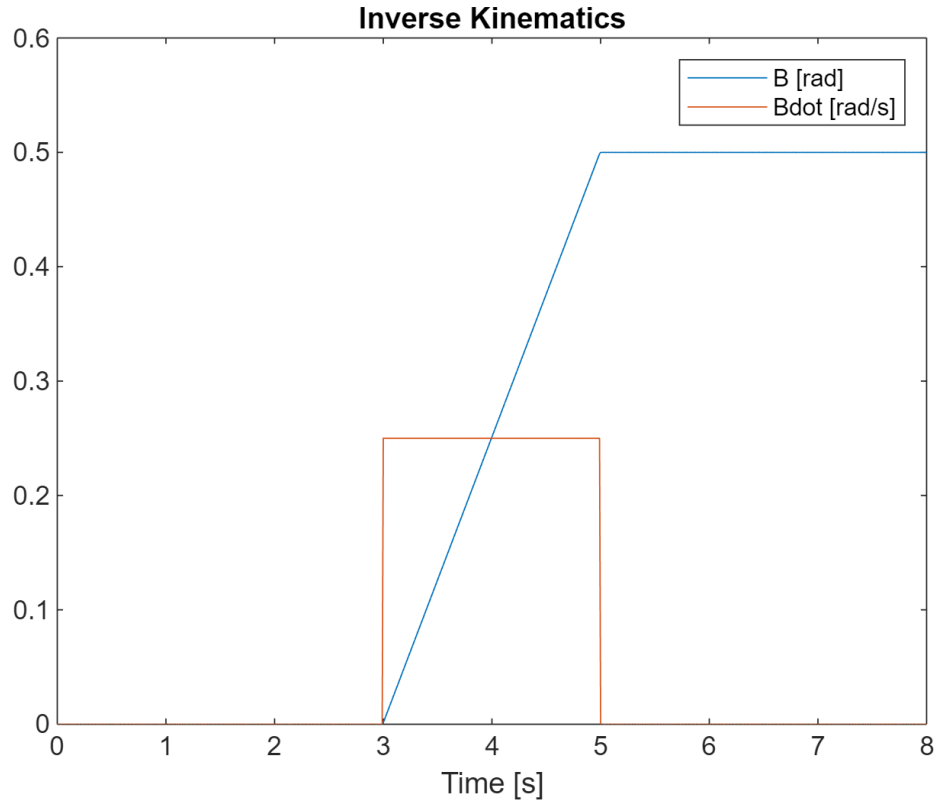
Arc movement: 2s R=4m

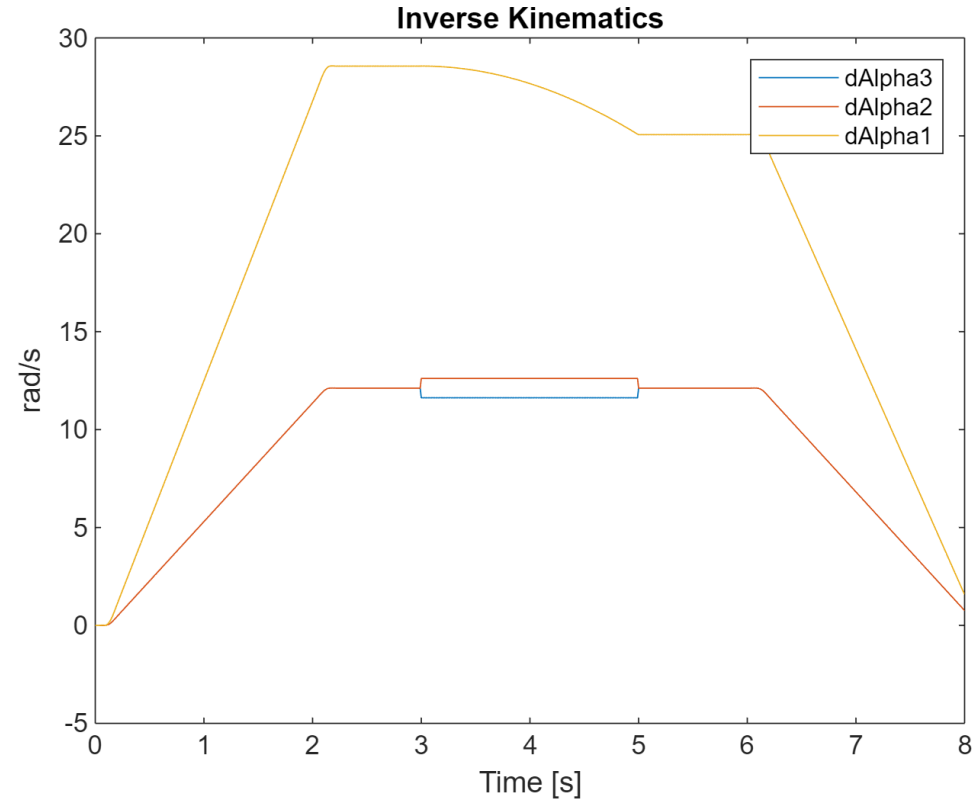
Straight line movement: 1s

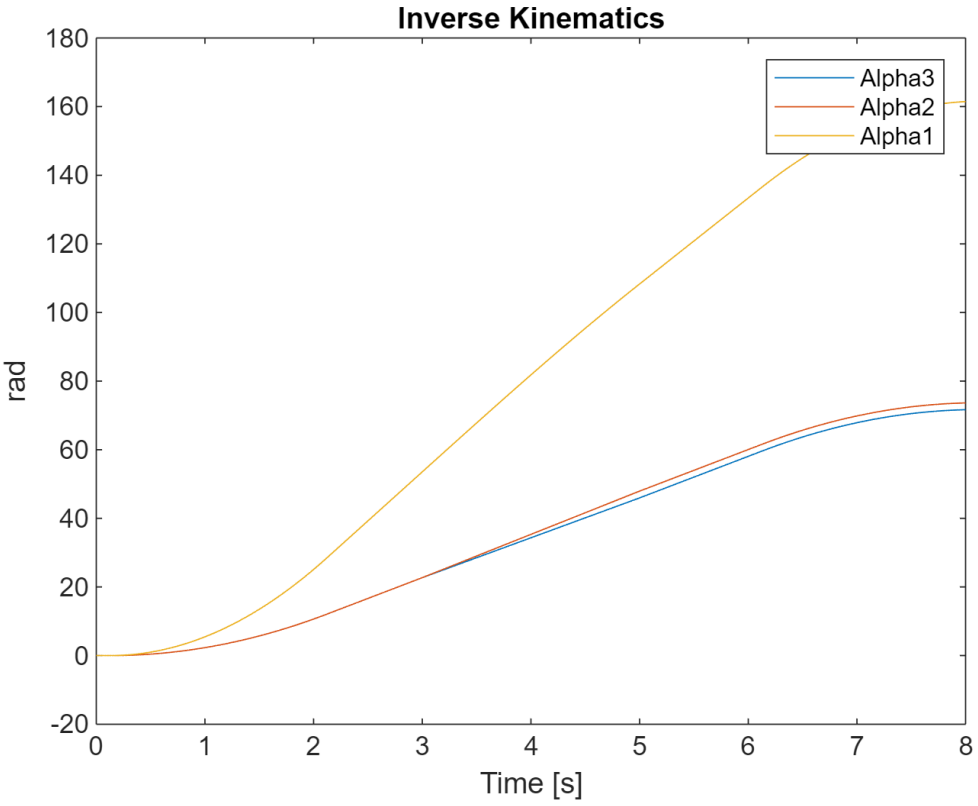
Decceleration time: 2s

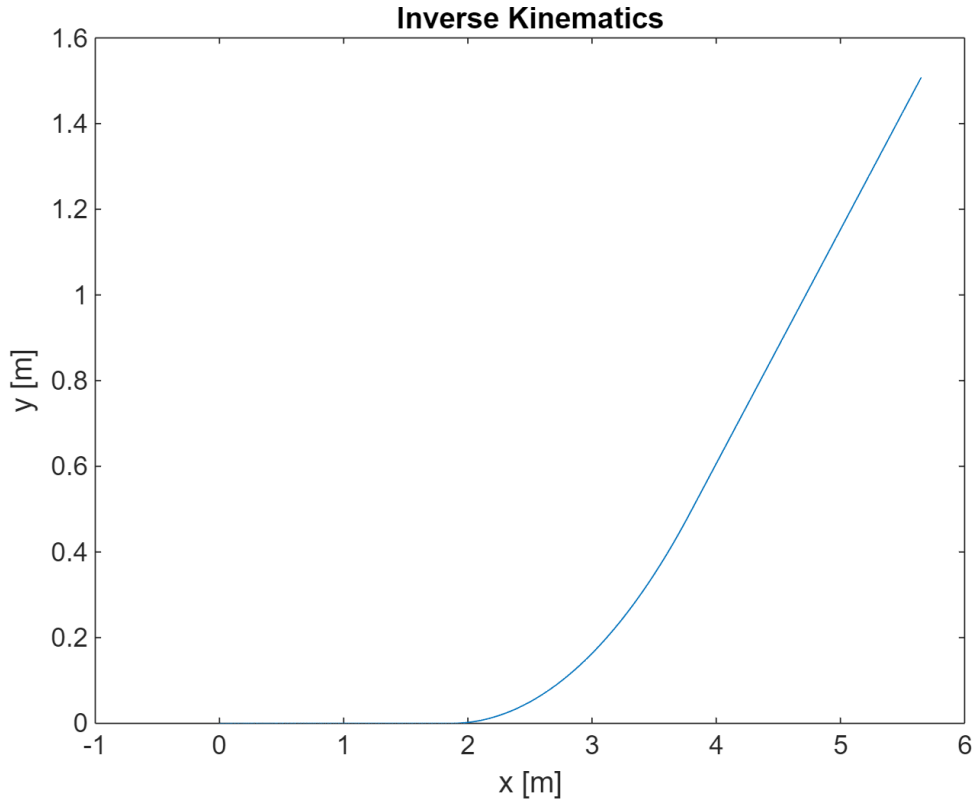
```
dataobj2=out.simout1;
labPlot(dataobj2)
```


Kinematics
VaT [m/s]
Trajectory signal
1
0.8
0.6
0.4
0.2
0
-0.2
0
1
2
3
4
5
6
7
8
Time [s]


Inverse Kinematics
B [rad]
Bdot [rad/s]
0.6
0.5
0.4
0.3
0.2
0.1
0
0
1
2
3
4
5
6
7
8
Time [s]

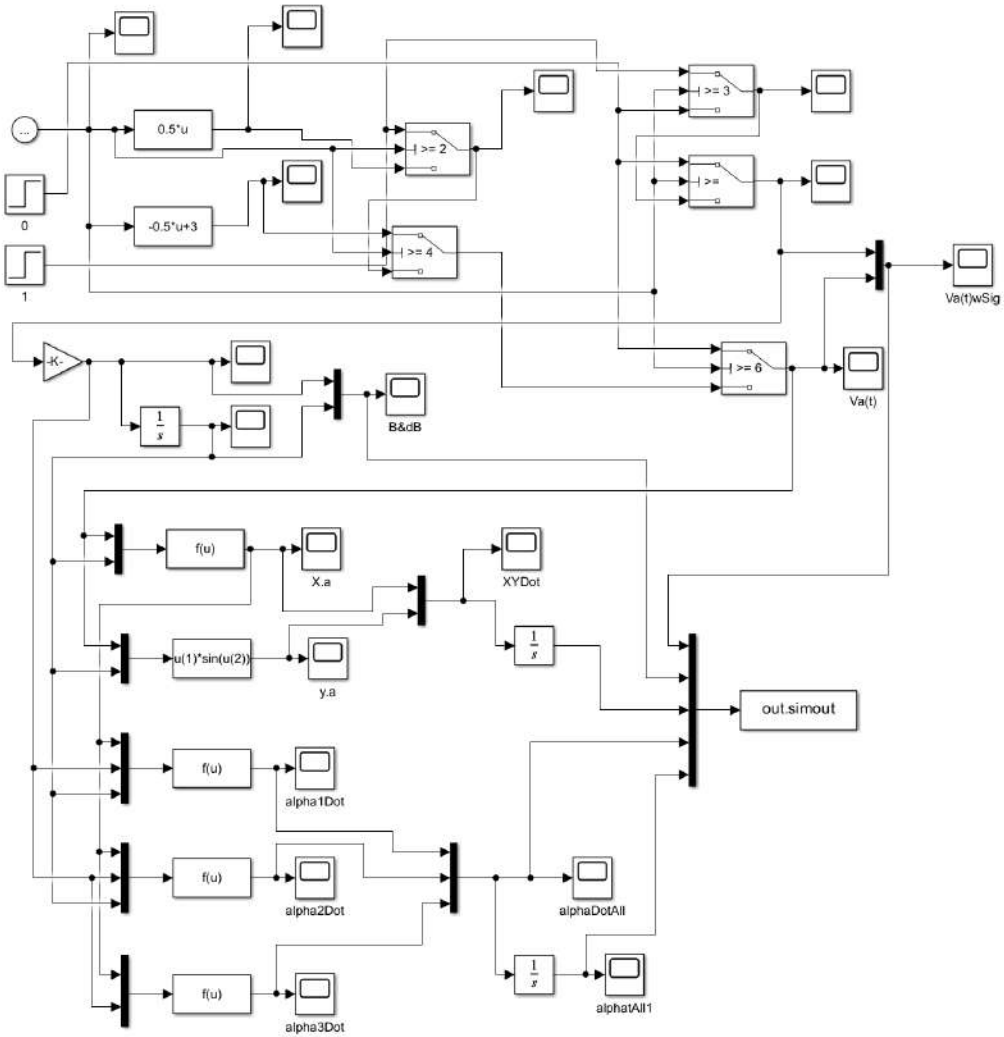

Inverse Kinematics
dAlpha3
dAlpha2
dAlpha1
rad/s
Time [s]
30
25
20
15
10
5
0
-5
0
1
2
3
4
5
6
7
8

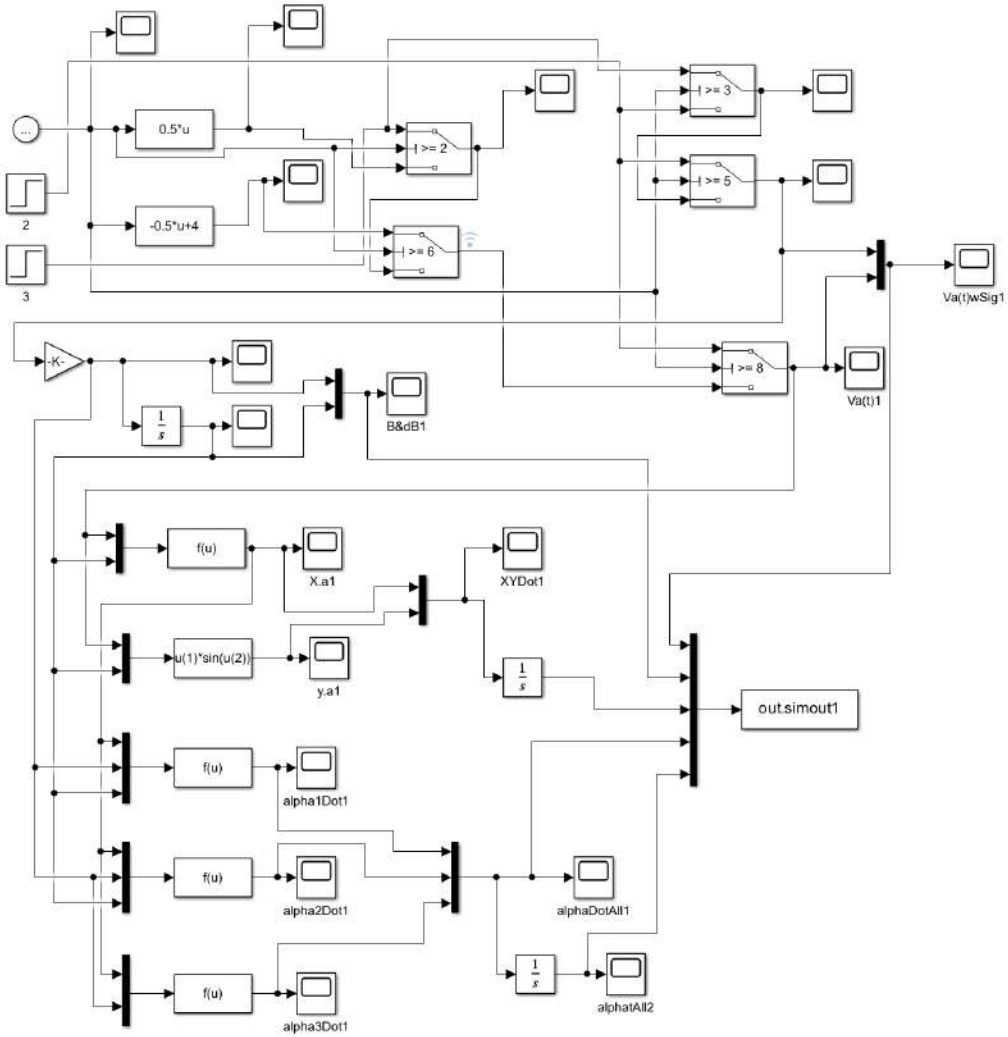

Inverse Kinematics
Alpha3
Alpha2
Alpha1
rad
Time [s]
180
160
140
120
100
80
60
40
20
0
-20
0
1
2
3
4
5
6
7
8




```
function labPlot(dataobj)
t=dataobj.Time;
VaT=dataobj.Data(:,2);
sig=dataobj.Data(:,1);
figure
plot(t,VaT,t,sig)
title('Kinematics')
xlabel('Time [s]')
legend('VaT [m/s]','Trajectory signal')

B=dataobj.Data(:,4);
Bdot=dataobj.Data(:,3);
figure
plot(t,B,t,Bdot)
title('Inverse Kinematics')
xlabel('Time [s]')
legend('B [rad]','Bdot [rad/s]')

a1=dataobj.Data(:,7);
a2=dataobj.Data(:,8);
a3=dataobj.Data(:,9);
figure
plot(t,a1,t,a2,t,a3)
title('Inverse Kinematics')
xlabel('Time [s]')
ylabel('rad/s')
```

```
legend('dAlpha3','dAlpha2','dAlpha1')

da1=dataobj.Data(:,10);
da2=dataobj.Data(:,11);
da3=dataobj.Data(:,12);
figure
plot(t,da1,t,da2,t,da3)
title('Inverse Kinematics')
xlabel('Time [s]')
ylabel('rad')
legend('Alpha3','Alpha2','Alpha1')

x=dataobj.Data(:,5);
y=dataobj.Data(:,6);
figure
plot(x,y)
title('Inverse Kinematics')
xlabel('x [m]')
ylabel('y [m]')
end
```


0.5*u
-0.5*u+3
0
1
>= 2
>= 3
>= 4
>= 6
Va(t)wSig
Va(t)
B&dB
-K-
f(u)
X.a
XYDot
u(1)*sin(u(2))
y.a
out.simout
alpha1Dot
alpha2Dot
alpha3Dot
alphaDotAll
alphatAll1


0.5*u
-0.5*u+4
2
3
>= 2
>= 3
>= 5
>= 6
>= 8
Va(t)wSig1
Va(t)1
B&dB1
-K-
f(u)
X.a1
XYDot1
u(1)*sin(u(2))
y.a1
out.simout1
alpha1Dot1
alpha2Dot1
alpha3Dot1
alphaDotAll1
alphatAll2