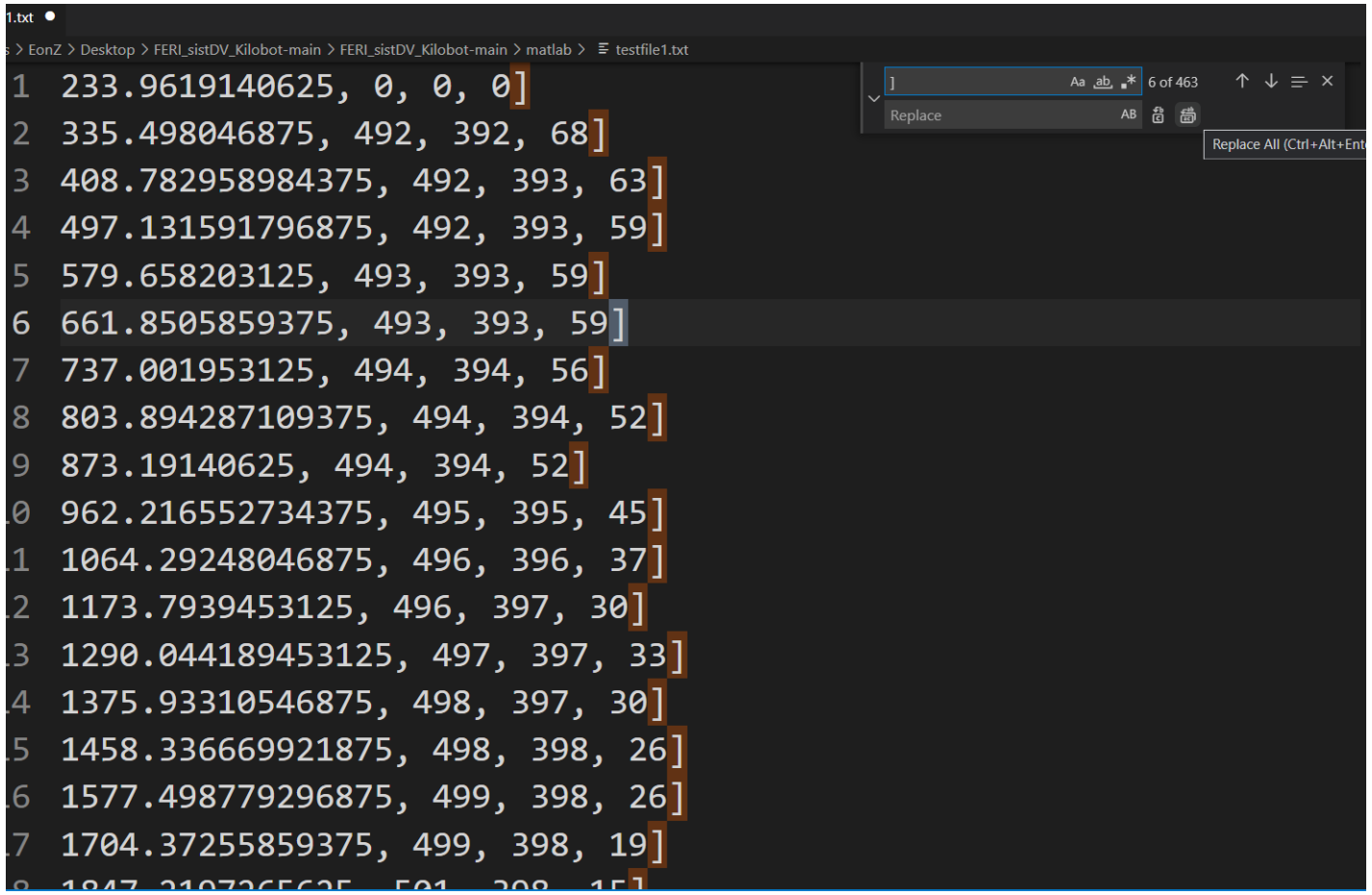
IDENTIFIKACIJA MODELA

skupini 6 in 7

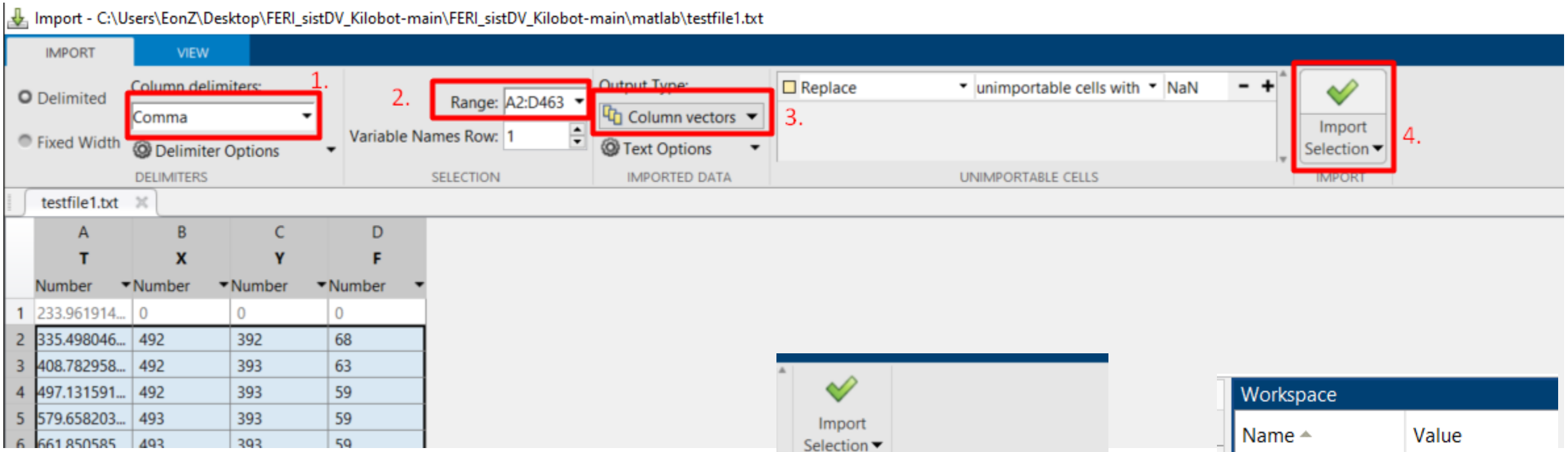
Posnetek delovanja

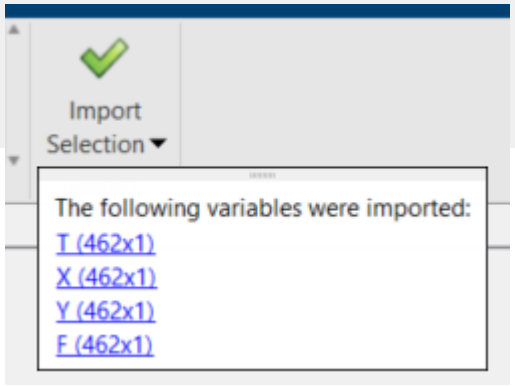
Obdelava podatkov

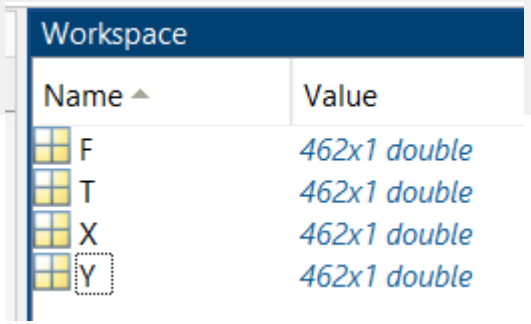
```
1  [233.9619140625, 0, 0, 0]
2  [335.498046875, 492, 392, 68]
3  [408.782958984375, 492, 393, 63]
4  [497.131591796875, 492, 393, 59]
5  [579.658203125, 493, 393, 59]
6  [661.8505859375, 493, 393, 59]
7  [737.001953125, 494, 394, 56]
8  [803.894287109375, 494, 394, 52]
9  [873.19140625, 494, 394, 52]
10 [962.216552734375, 495, 395, 45]
11 [1064.29248046875, 496, 396, 37]
12 [1173.7939453125, 496, 397, 30]
13 [1290.044189453125, 497, 397, 33]
14 [1375.93310546875, 498, 397, 30]
15 [1458.336669921875, 498, 398, 26]
16 [1577.498779296875, 499, 398, 26]
17 [1704.37255859375, 499, 398, 19]
```



Uvoz podatkov v Matlab







Priprava podatkov na izris

```
%clear
clc
close all
%https://ctms.engin.umich.edu/CTMS/index.php?example=Introduction&section=ControlStateSpace
load("matlab.mat")
generate = true;
N = 462;
T=T*1E-3;
if (generate)
    t = 1:N;
    d_X = zeros(1,N);   %Rezercacija prostora v pomnilniku
    d_Y = zeros(1,N);
    d_F = zeros(1,N);

    dd_X = zeros(1,N);
    dd_Y = zeros(1,N);
    dd_F = zeros(N);

    x1= zeros(1,N);
    x2 = zeros(1,N);

     for i=1:N              %Generiranje vhodnih funkcij
         if(T(i)<=6.309)
             x1(i) = 1500;
         elseif ((T(i) > 7.363 && T(i)<=37.482))
             x2(i) = 2000;
         elseif (T(i) > 38.535)
             x1(i) = 1400;
             x2(i) = 1400;
         end
     end
```

```
sort = true;                %Pretvorba merjenega položaja v "zvezno" verzijo
F2=F;                       %Vrednosti niso več 0-360
d_F2 = d_F;
dd_F2 = dd_F;
while (sort)
    sort =false;
    for i = 2:N
        if((F2(i)-F2(i-1)) > 300)
            F2(i) = F2(i)-360;
            sort =true;
        elseif ((F2(i)-F2(i-1)) < -300)
            F2(i) = F2(i)+360;
            sort =true;
        end
        d_F2(i) = (F2(i)-F2(i-1))/(T(i)-T(i-1));
        dd_F2(i)= (d_F2(i)-d_F2(i-1))/(T(i)-T(i-1));
    end
end

x1=x1';
x2=x2';
sum_dT=0;
    for i=2:N       %Računanje prvih odvodov položajev, povprečnega časa zajema
        d_T=T(i)-T(i-1);
        sum_dT=sum_dT+d_T;

        d_X(i)=(X(i)-X(i-1))/d_T;
        d_Y(i)=(Y(i)-Y(i-1))/d_T;
        d_F(i)=(F(i)-F(i-1))/d_T;
    end
avg_dT=sum_dT/N

    d_X(1)=d_X(2);
    d_Y(1)=d_Y(2);
    d_F(1)=d_F(2);
```

Priprava podatkov na izris

```
67
68      for i=2:N       %Računanje drugih odvodov položajev
69          dd_X(i-1)=(d_X(i)-d_X(i-1))/(T(i)-T(i-1));
70          dd_Y(i-1)=(d_Y(i)-d_Y(i-1))/(T(i)-T(i-1));
71          dd_F(i-1)=(d_F(i)-d_F(i-1))/(T(i)-T(i-1));
72      end
73      dd_X(1)=dd_X(2);
74      dd_Y(1)=dd_Y(2);
75      dd_F(1)=dd_F(2);
76
77  end
78  %Pakiranje vhodov in izhodov v skupne spremenljivke
79  X_in = [x1,x2];
80  Y_out=[X, Y, F2];
```

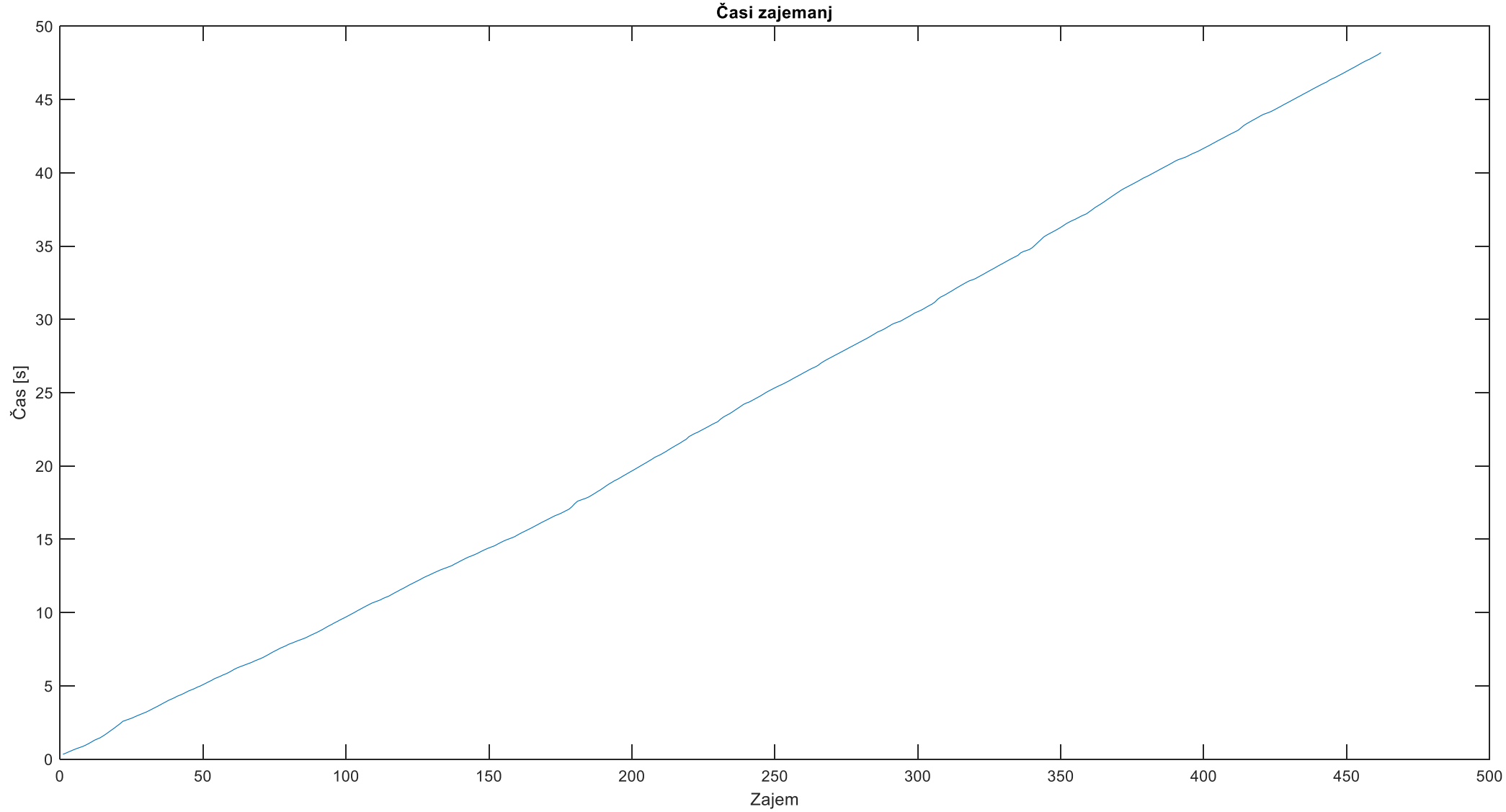
```
avg_dT =

    0.1036
```

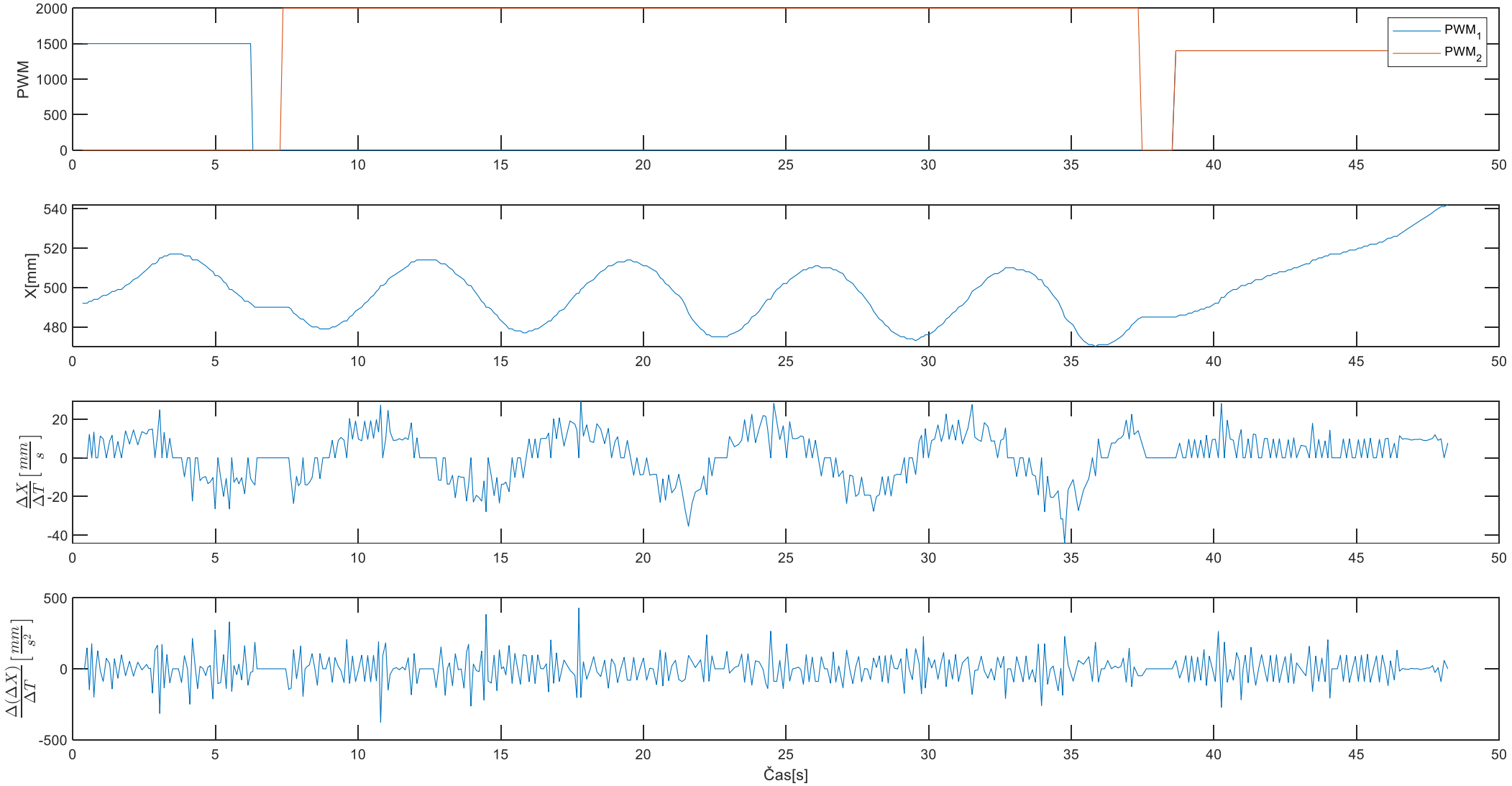
Izris grafov

```
84   plot(t,T) %T
85   title("Časi zajemanj")
86   xlabel("Zajem")
87   ylabel("Čas [s]")
88
89   figure(2)
90   subplot(4,1,1);
91   plot(T,x1,T,x2)
92   ylabel("PWM")
93   legend("PWM_1", "PWM_2");
94   subplot(4,1,2);
95   plot(T,X)
96   ylabel("X[mm]")
97   subplot(4,1,3);
98   plot(T,d_X)
99   ylabel("$\frac{\Delta X}{\Delta T}[\frac{mm}{s}]$",'interpreter','latex','FontSize', 14)
100  subplot(4,1,4);
101  plot(T,dd_X)
102  ylabel('$\frac{\Delta (\Delta X)}{\Delta T}[\frac{mm}{s^{2}}]$','interpreter','latex','FontSize', 14)
103  xlabel("Čas[s]")
104
105  figure(3)
106  subplot(4,1,1);
107  plot(T,x1,T,x2)
108  ylabel("PWM")
109  legend("PWM_1", "PWM_2");
110  subplot(4,1,2);
111  plot(T,Y)
112  ylabel("Y[mm]")
113  subplot(4,1,3);
114  plot(T,d_Y)
115  ylabel("$\frac{\Delta Y}{\Delta T}[\frac{mm}{s}]$",'interpreter','latex','FontSize', 14)
116  subplot(4,1,4);
117  plot(T,dd_Y)
118  ylabel("$\frac{\Delta (\Delta Y)}{\Delta T}[\frac{mm}{s^{2}}]$",'interpreter','latex','FontSize', 14)
119  xlabel("Čas[s]")
```

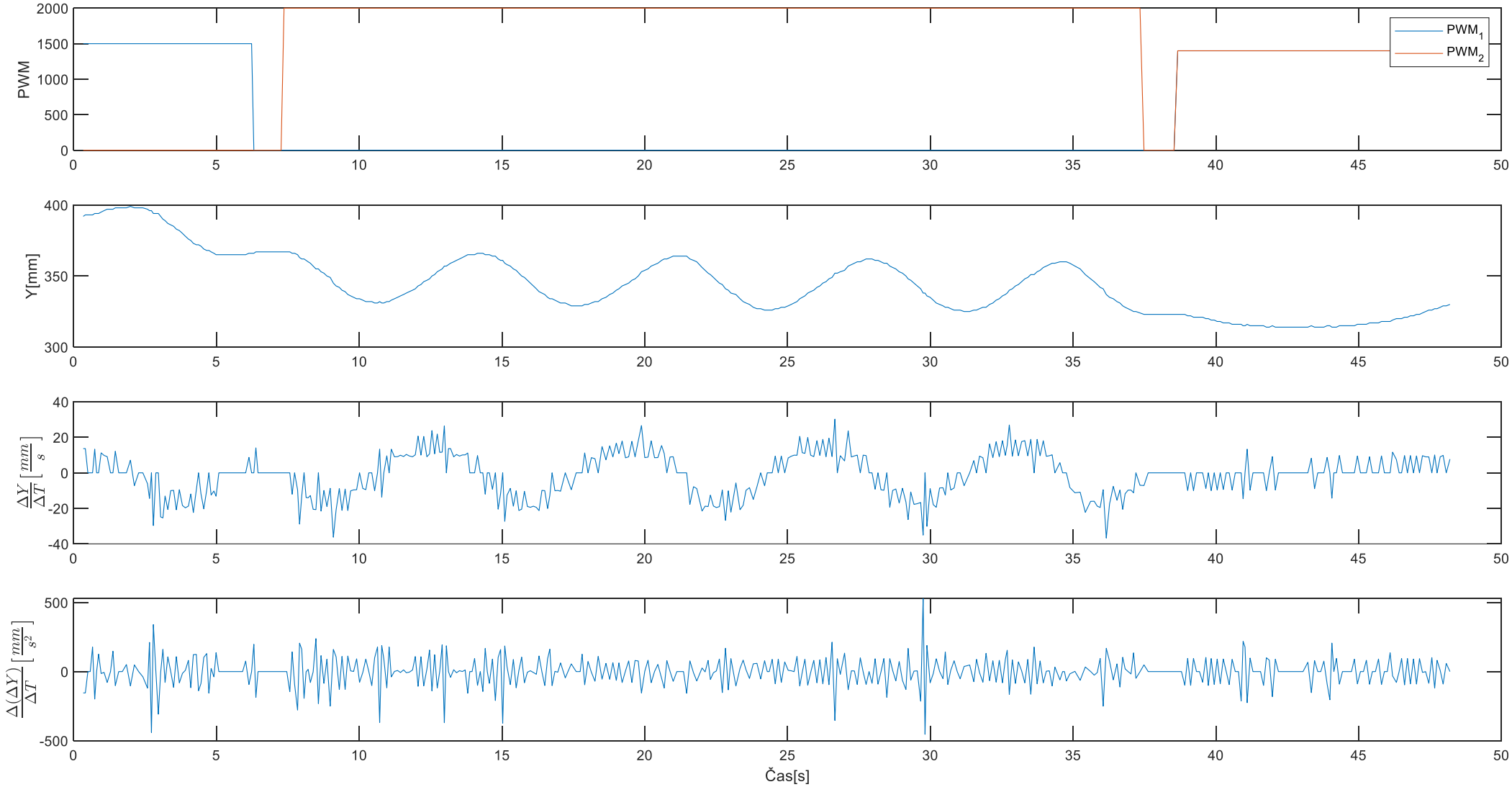
```
121  figure(4)
122  subplot(4,1,1);
123  plot(T,x1,T,x2)
124  ylabel("PWM")
125  legend("PWM_1", "PWM_2");
126  subplot(4,1,2);
127  plot(T,F)
128  ylabel("\theta_{kamera}[\circ]")
129  subplot(4,1,3);
130  plot(T,d_F)
131  ylabel("$\frac{\Delta \theta _{kamera}}{\Delta T}[\frac{\circ}{s}]$",'interpreter','latex','FontSize', 14)
132  subplot(4,1,4);
133  plot(T,dd_F)
134  ylabel("$\frac{\Delta (\Delta \theta _{kamera})}{\Delta T}[\frac{\circ}{s^{2}}]$",'interpreter','latex','FontSize', 14)
135  xlabel("Čas[s]")
136
137  figure(5)
138  subplot(4,1,1);
139  plot(T,x1,T,x2)
140  ylabel("PWM")
141  legend("PWM_1", "PWM_2");
142  subplot(4,1,2);
143  plot(T,F2)
144  ylabel("\theta_{zvezni}[\circ]")
145  subplot(4,1,3);
146  plot(T,d_F2)
147  ylabel("$\frac{\Delta \theta _{zvezni}}{\Delta T}[\frac{\circ}{s}]$",'interpreter','latex','FontSize', 14)
148  subplot(4,1,4);
149  plot(T,dd_F2)
150  ylabel("$\frac{\Delta (\Delta \theta _{zvezni})}{\Delta T}[\frac{\circ}{s^{2}}]$",'interpreter','latex','FontSize', 14)
151  xlabel("Čas[s]")
```



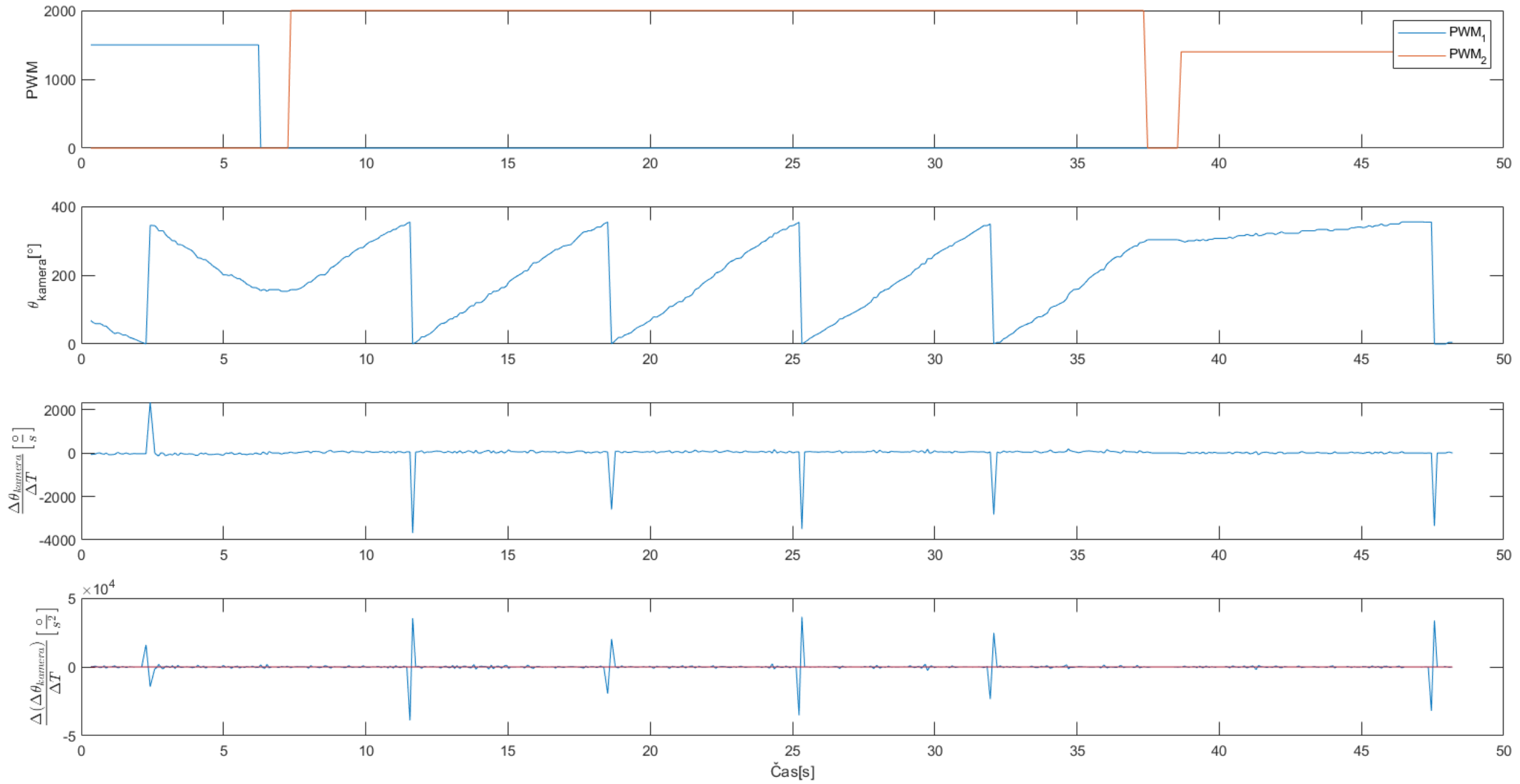
Časi zajemanj



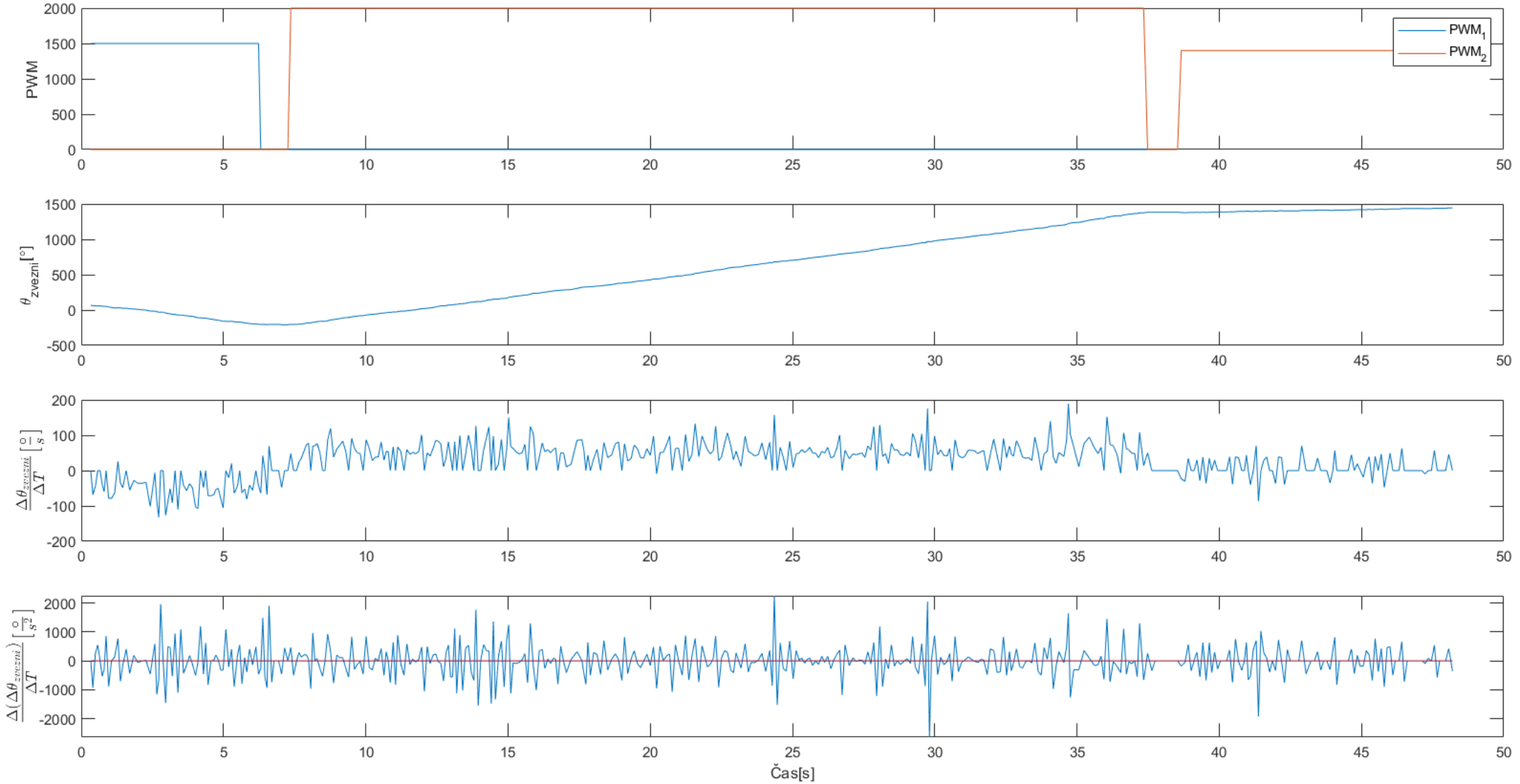
Položaj X



Položaj Y

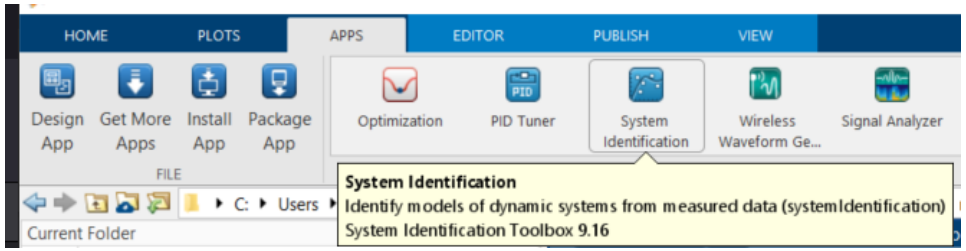

PWM
PWM1
PWM2
θkamera [°]
Δθkamera/ΔT [°/s]
Δ(Δθkamera/ΔT)/ΔT [°/s²]
×10^4
Čas[s]

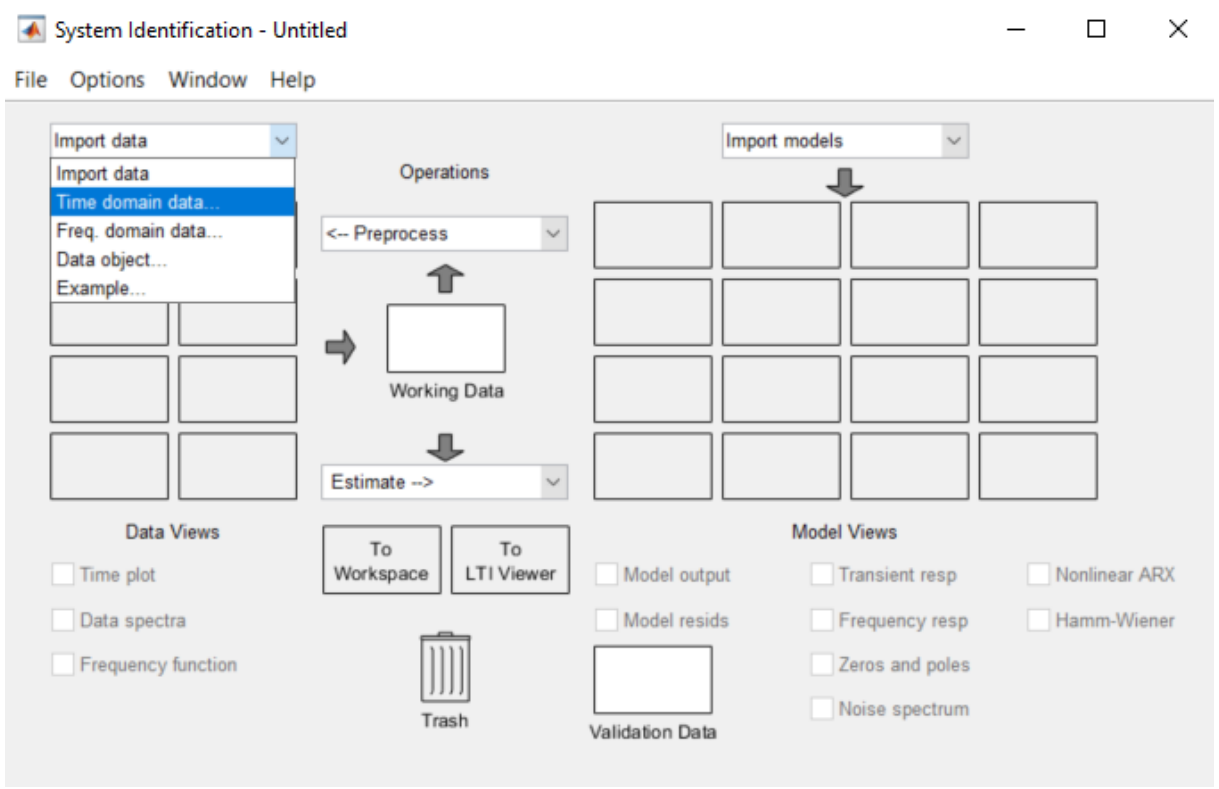
Θ na kameri

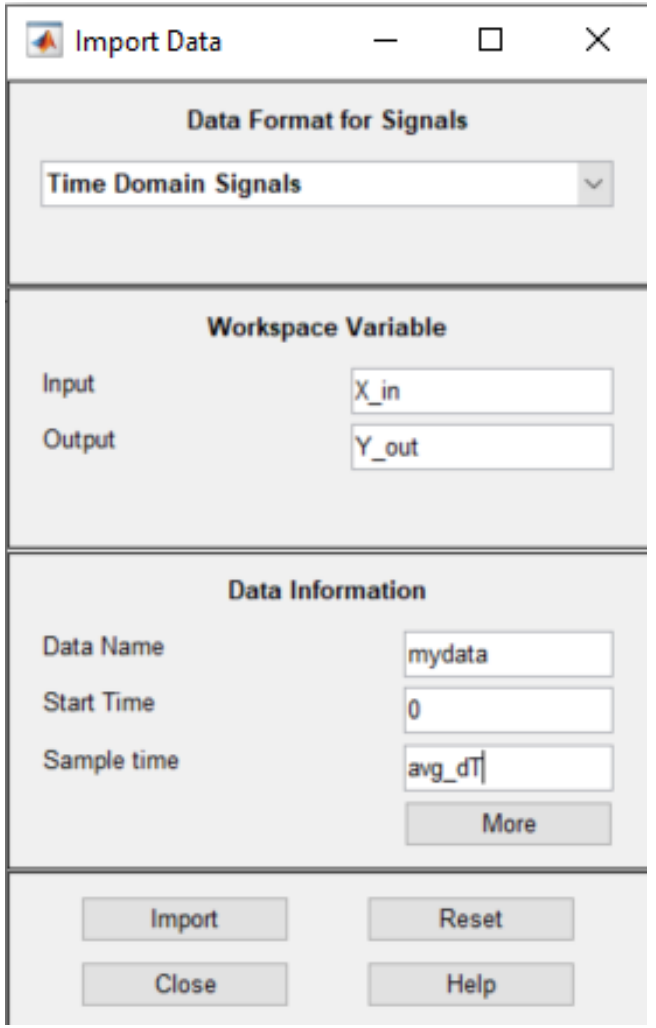


Θ “zvezni”

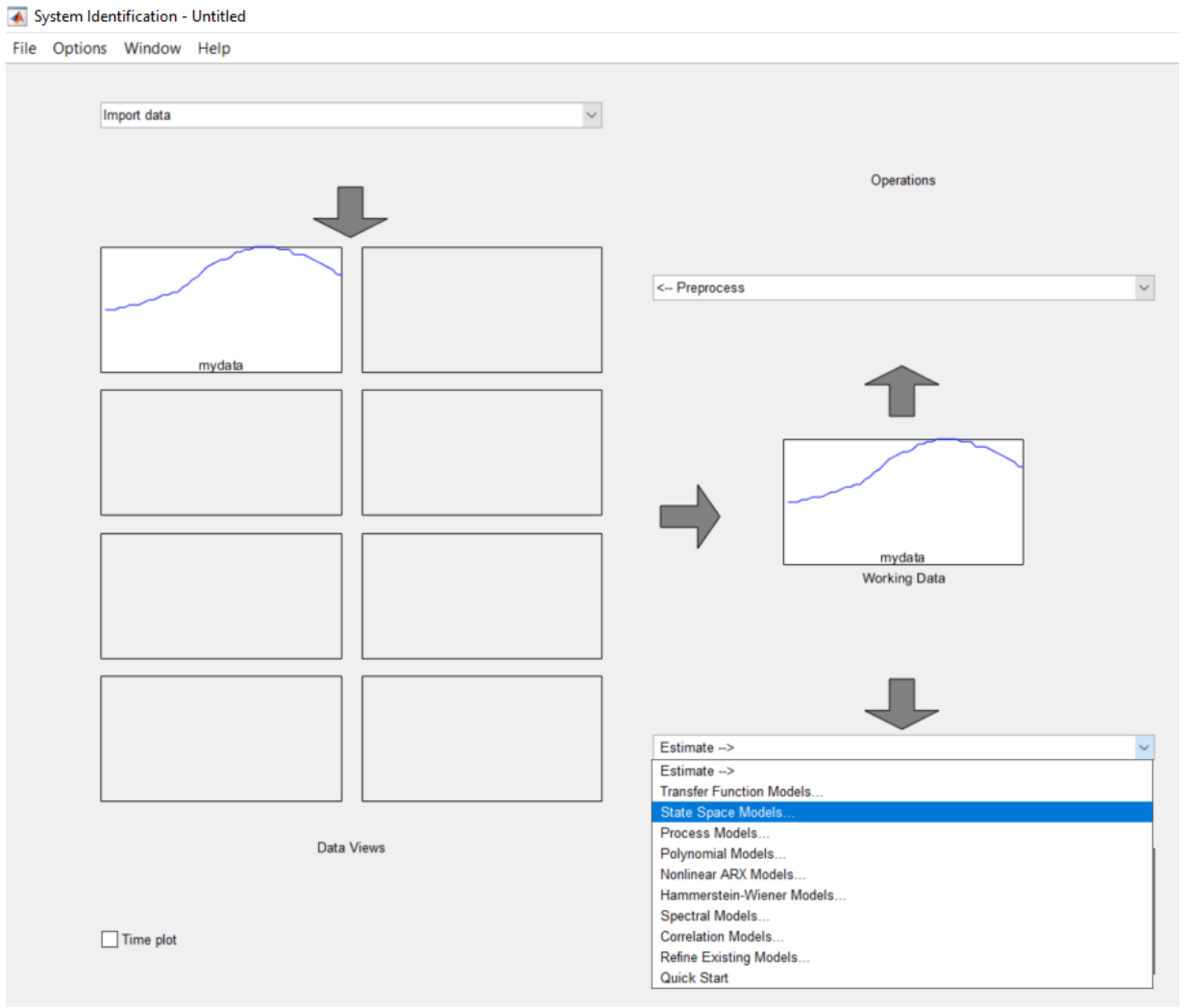
Uvoz v orodje za identifikacijo

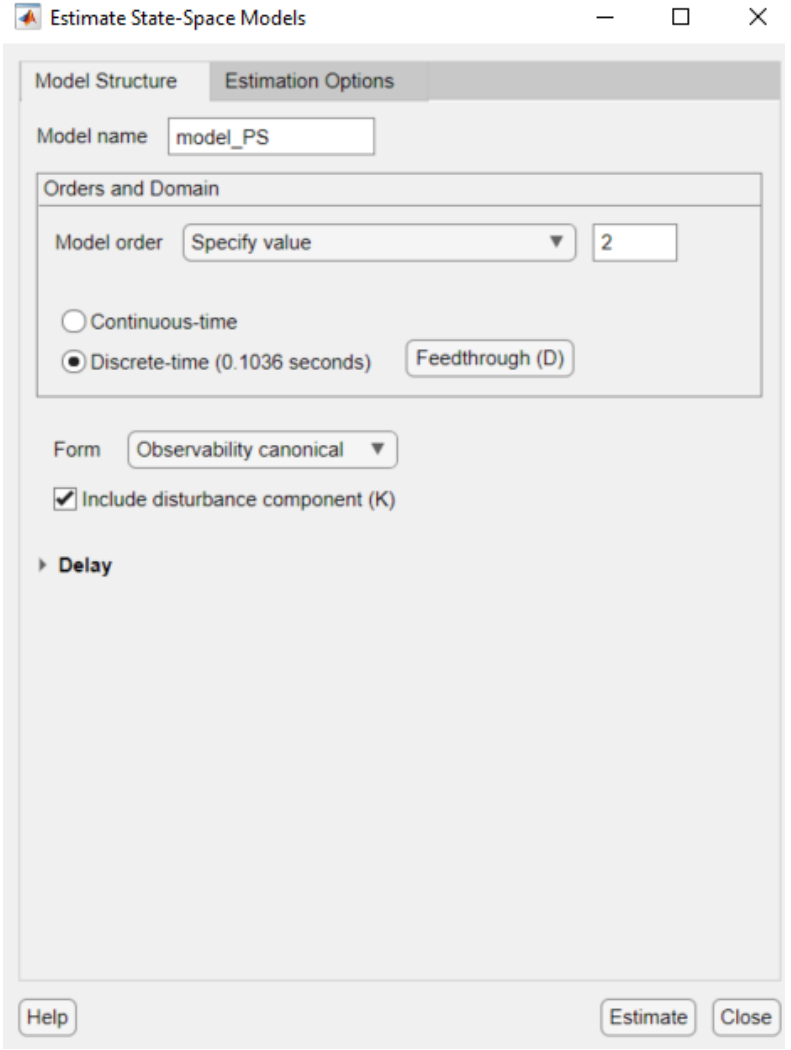




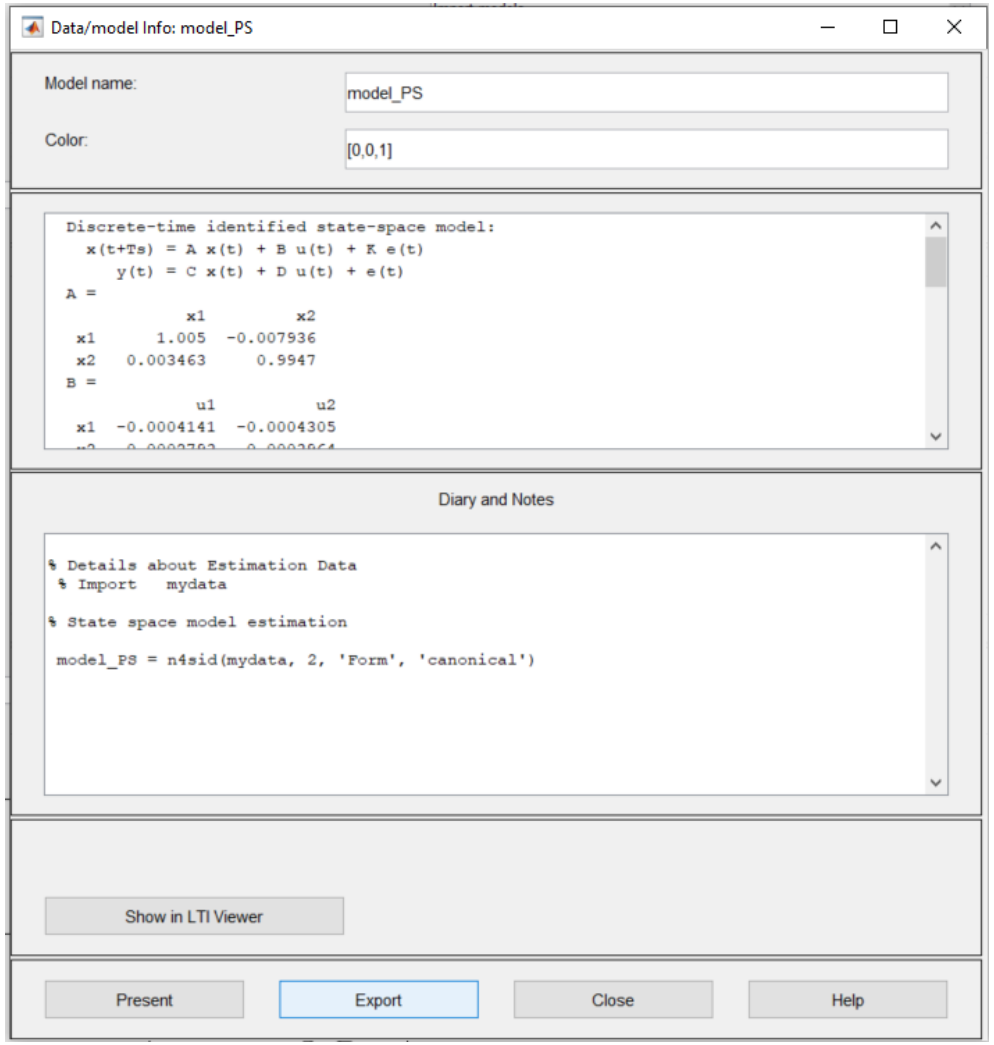


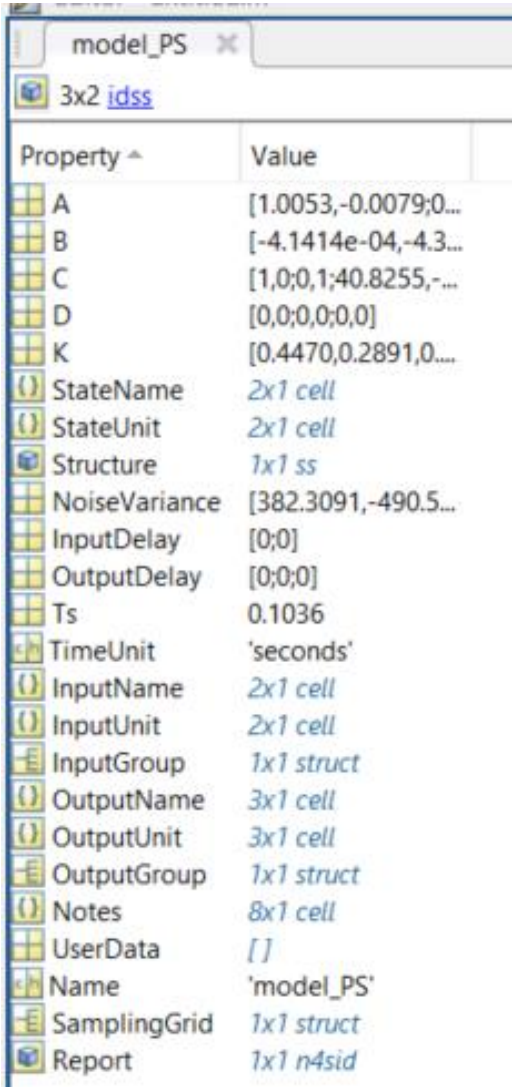
Identifikacija modela





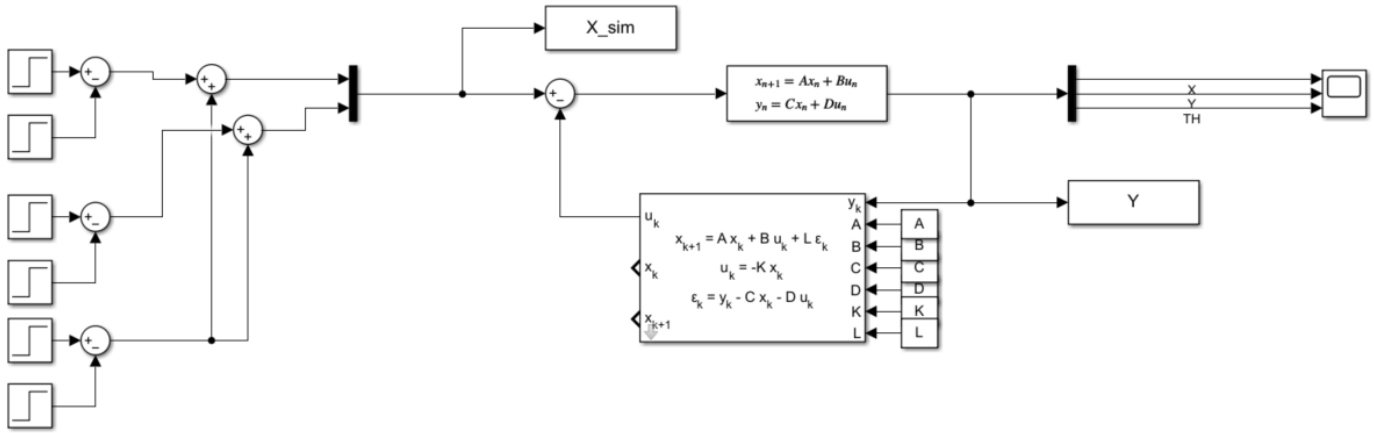
Izvoz podatkov





Priprava modela za simulacijo

```
152    %%
153
154    %Model v prostoru stanj in observer
155    %model_ps
156
157    A=model_PS.A;
158    B=model_PS.B;
159    C=model_PS.C;
160    D=model_PS.D;
161    K=model_PS.K;
162
163
164    L_T=place(A',C',[-12 -11]);
165    L=L_T';
166    X_in=[T x1 x2]
167
```



Izris simulacije modela

```
figure(6)
subplot(4,1,1);
plot(X_sim.time,X_sim.signals.values(:,1),X_sim.time,X_sim.signals.values(:,2))
ylabel("PWM")
legend("PWM_1", "PWM_2");
subplot(4,1,2);
plot(Y.time,Y.signals.values(:,1))
ylabel("X [mm]")
subplot(4,1,3);
plot(Y.time,Y.signals.values(:,2))
ylabel("Y [mm]")
subplot(4,1,4);
plot(Y.time,Y.signals.values(:,3))
ylabel("\theta [\circ]")
xlabel("Čas[s]")
```

Izris simulacije modela