

## Tugas 5 : Soal Pemodelan dan Simulasi

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Pemodelan dan Identifikasi Sistem-1

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Dari 2 artikel berikut,

- Pengidentifikasian Parameter Fungsi Alih Sistem Pada Plant Simulasi Orde Tiga Dan Empat Dengan Metode Algoritma Genetik
- Sistem Identifikasi Model Dinamik Proton Exchange Membrane Fuel Cell (Pemfc) Dalam Struktur Blok Wiener

1. cari permasalahan
2. metode dihubungkan paramterik dan nonparamterik
3. Hasil

Jawab:

1. Permasalahan:

Studi kasus pertama ialah prediksi laju kendaraan menggunakan filter moving average dan ANN. Diketahui,  $F(t)$  = gaya yang dihasilkan oleh mobil =  $80t$  N yang diasumsikan.  $V$  = kecepatan ( $m/s$ )  $M$  = massa kendaraan =  $1000kg$   $b$  = koefisien gesekan =  $40N_s/m$

2. dengan metode non paramterik ANN Dengan Hukum Newton Aksi-Reaksi

$$F - F_{gesek} = m\alpha$$

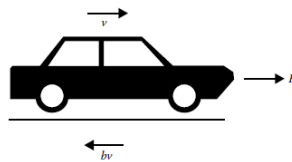


Figure 1: Gambar Model

$$F - bv = m\alpha$$

$$F = m \frac{dv}{dt} + bv$$

jadi,

$$80t = 1000 \frac{dv}{dt} + 40v$$

sehingga laplace-nya

$$V(S) = \frac{2}{s^2} - \frac{50}{s} + \frac{50}{s + 0.04}$$

inverse laplace

$$v(t) = 2t - 50 + 50e^{-0.04t}$$

Dengan Matlab :

```
clear;
% Define and plot time vs velocity for the model
t=[0:.5:30]';
v=2*t-50+50*exp(-0.04*t);
grid
figure(1);
plot(t,v);
xlabel("time in seconds");ylabel("speed in m/s");

%Define and plot training as well as checking data
data=[t v];
trndata=data(1:2:size(t),:);
chkdata=data(2:2:size(t),:);
grid
figure(2);
plot(trndata(:,1),trndata(:,2),"o",chkdata(:,1),chkdata(:,2),"x");
xlabel("time in seconds");ylabel("speed in m/s");
%initialize ANN
trainpoint=trndata(:,1)';
trainoutput=trndata(:,2)';
net=newff(minmax(trainpoint),[10 1],{'tansig' 'purelin'});
%Simulate and plot the network ouput without training
Y=sim(net,trainpoint);
grid
figure(3);
plot(trainpoint,trainoutput,trainpoint,Y,"o");
%Initialize parameter
net.trainParam.epochs=100;
net.trainParam.goal=0.0001;
%Train the network and plot the output
```

```

net=train(net,trainpoint,trainoutput);
Y=sim(net,trainpoint);
figure(4);
plot(trainpoint,trainoutput,trainpoint,Y,"o");
%test the network and plot the error
checkpoint=chkdata(:,1)';
checkoutput=chkdata(:,2)';
W=sim(net,checkpoint);
e=W-checkoutput;
grid
figure(5);
plot(e);

```

### 3. Hasil

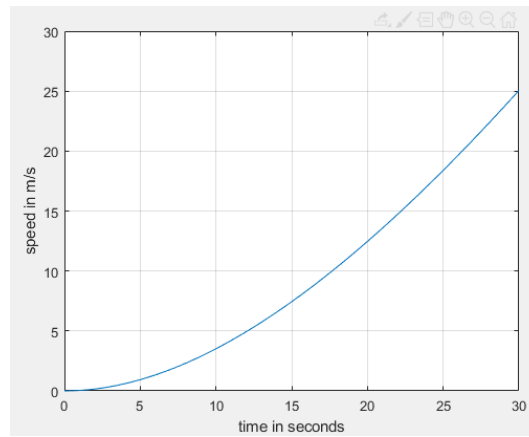


Figure 2: Grafik Waktu Kontinyu

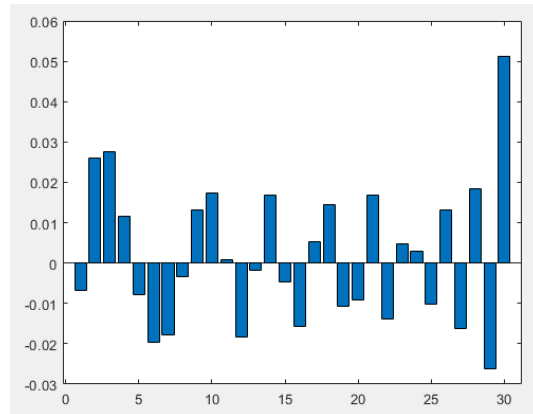


Figure 3: Bar Pembelajaran ANN

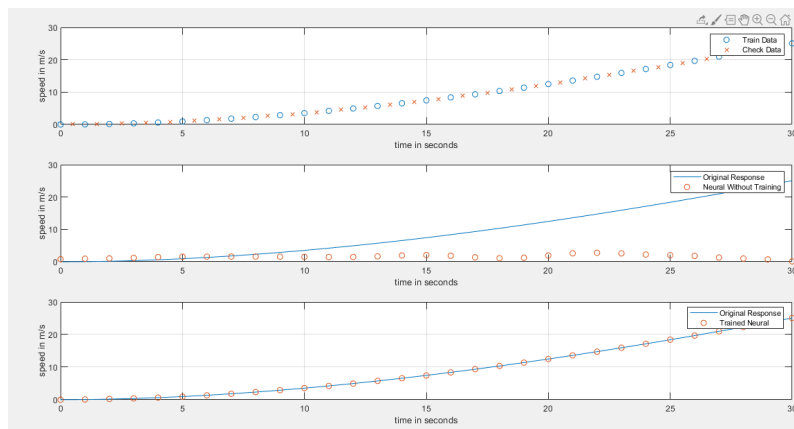


Figure 4: Model ANN