Sensor Fusion GNSS+INS simulation

```
close all
clear
```

Loading data from GNSSaidedINS_data.mat and defautl settings

```
disp('Loads data');
```

```
Loads data
```

```
load('GNSSaidedINS_data.mat');
disp('Loads Default settings');
```

```
Loads Default settings
```

```
settings=get_settings();
```

Select sigma_speed

```
settings.sigma_speed = 20;
```

Select sigma_non_holonomic

```
settings.sigma_non_holonomic =20;
```

Sensor fusion options:

```
if true
    settings.gnss_outage = 'on';
else
    settings.gnss_outage = 'off';
end
if true
    settings.non_holonomic = 'on';
else
    settings.non_holonomic = 'off';
end
if true
    settings.speed_aiding = 'on';
else
    settings.speed_aiding = 'off';
end
```

Start simulation:

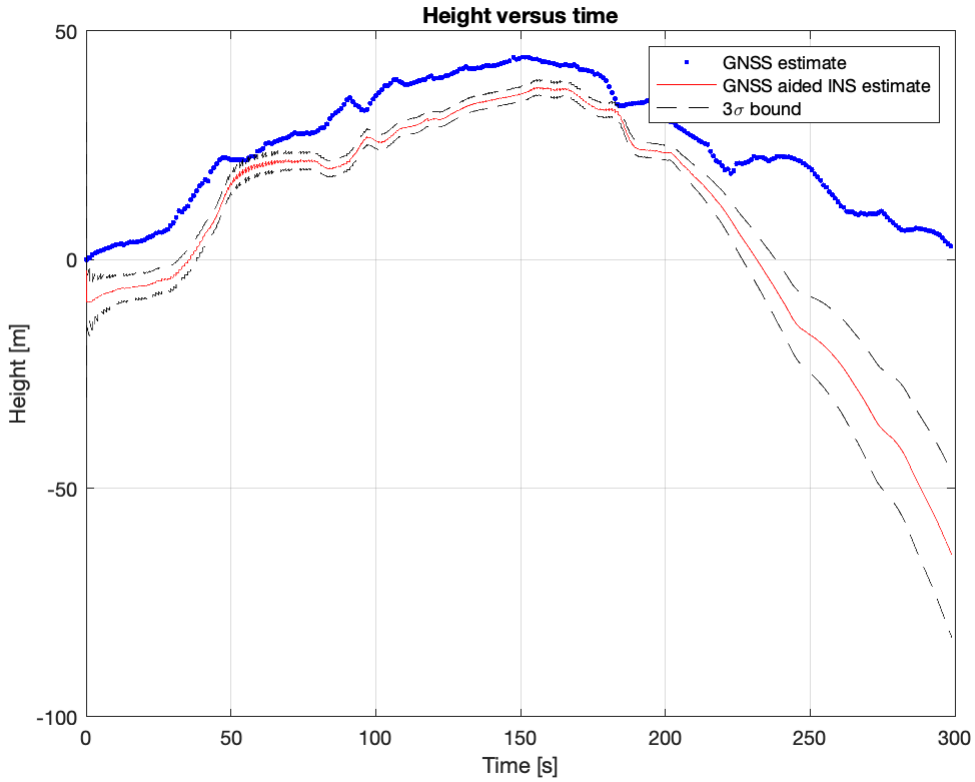
```


disp('Runs the GNSS-aided INS')
```

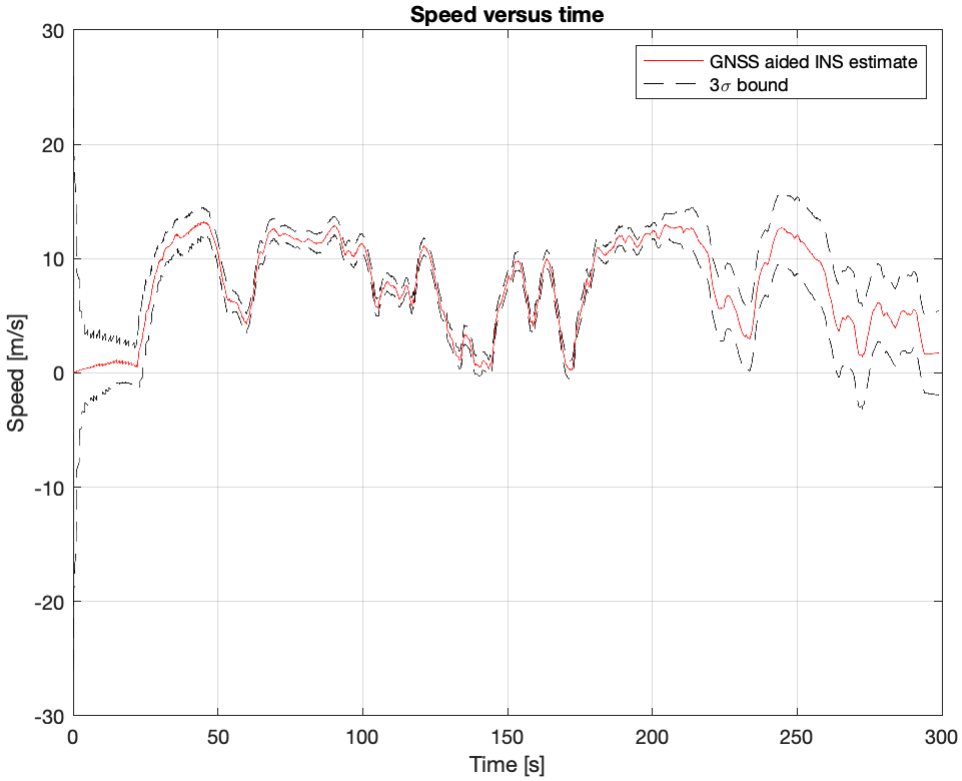
```
Runs the GNSS-aided INS
```

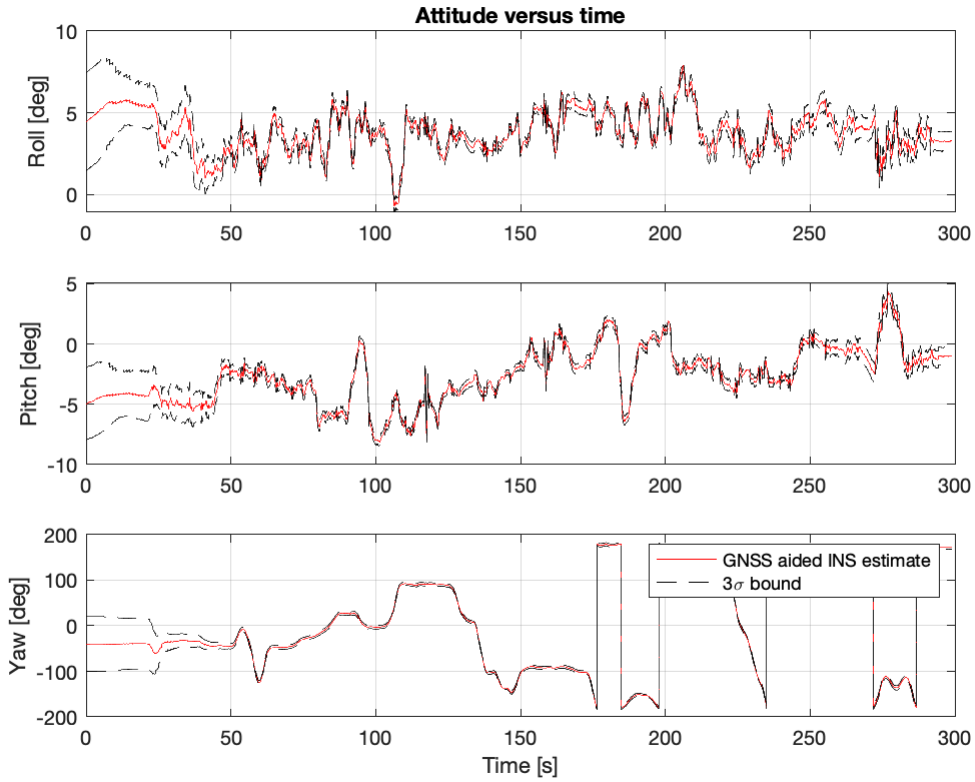
```
out_data=GPSaidedINS(in_data,settings);

disp('Plot data')
```

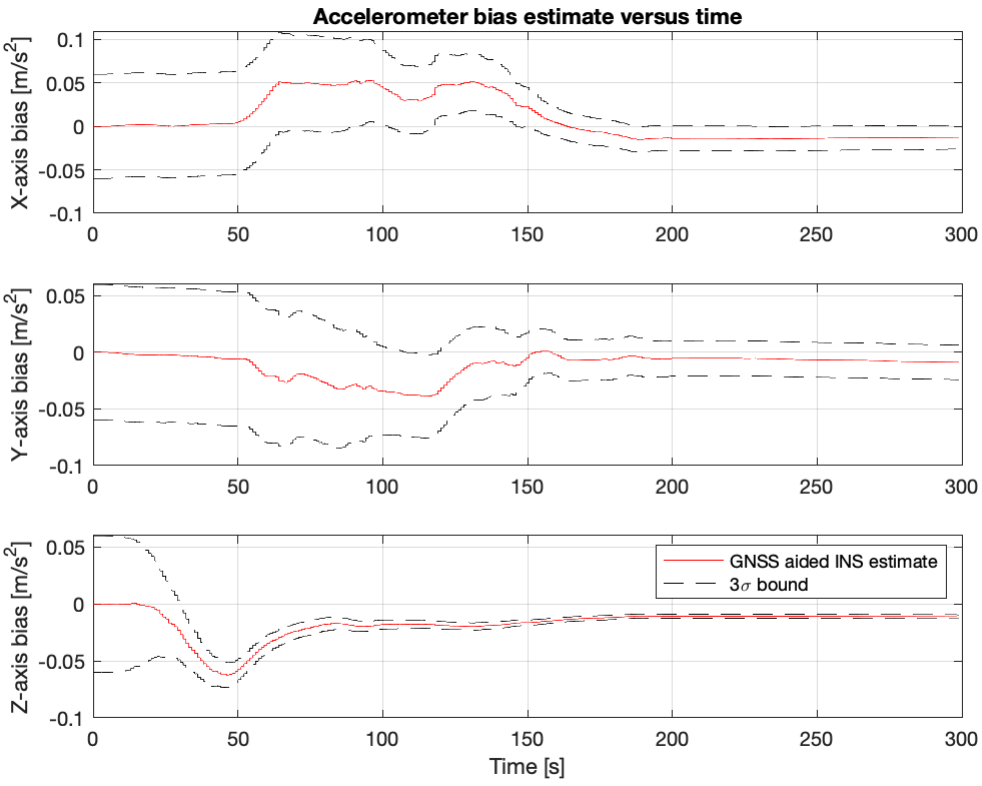
Plot data

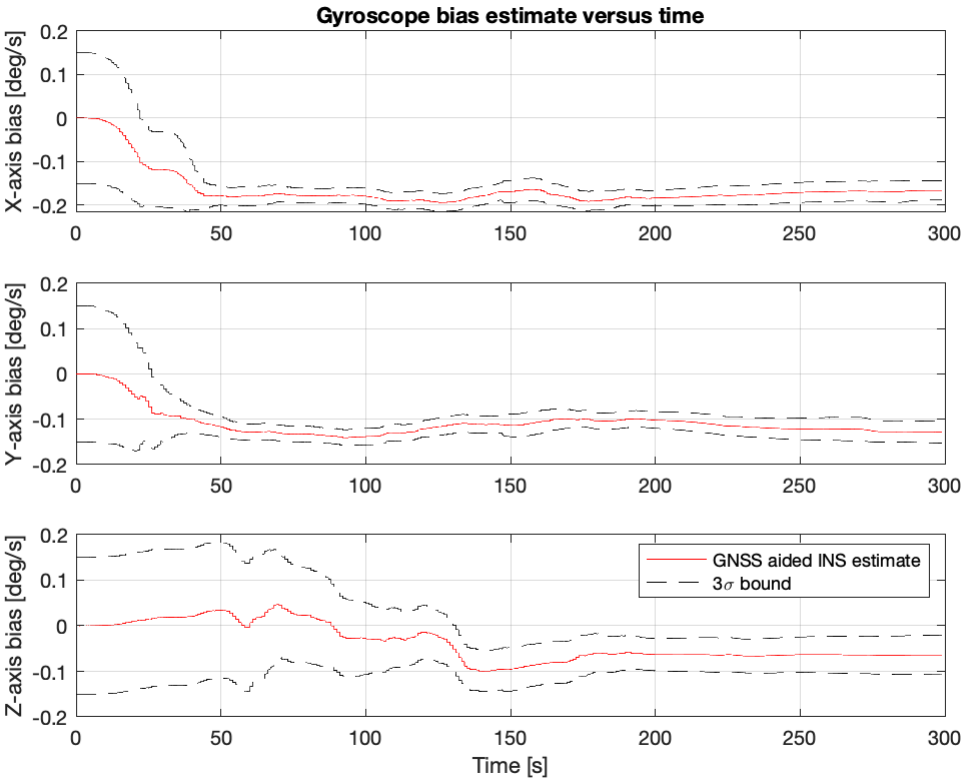
```
err = plot_data(in_data,out_data,'True');drawnow
```

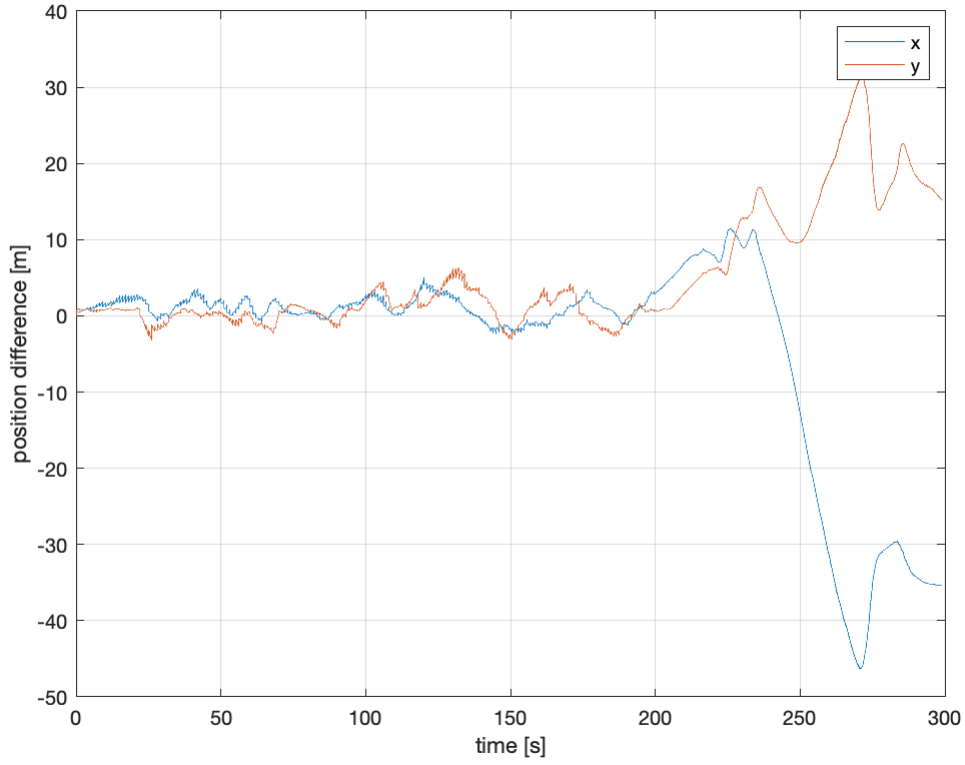





Attitude versus time
Roll [deg]
Pitch [deg]
Yaw [deg]
Time [s]
GNSS aided INS estimate
3σ bound


Accelerometer bias estimate versus time
X-axis bias [m/s²]
Y-axis bias [m/s²]
Z-axis bias [m/s²]
Time [s]
GNSS aided INS estimate
3σ bound






```
fprintf('Error: %.2f.\n', err);
```

```
Error: 16.83.
```

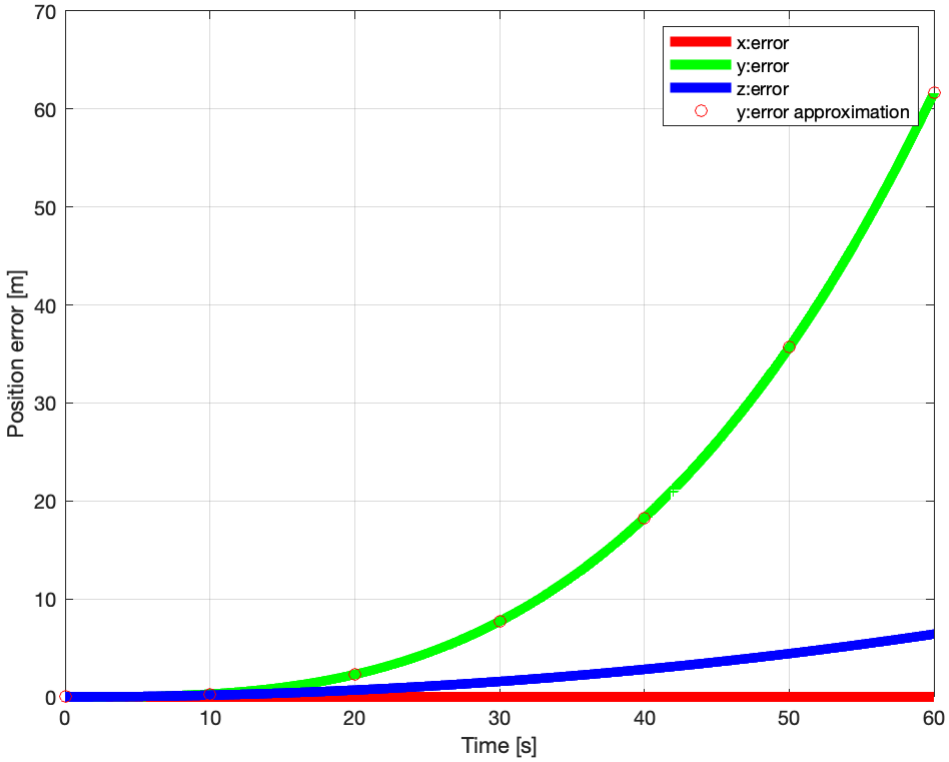
Error in different locations

```
close all
clear
```

General Settings:

```
polDegree = 3;

gyroBias = 0.01;

gh = [55,51];
```

```
Ts=0.01; %Sampling period of the data
Tmax=60;
t=0:Ts:Tmax; %6001 sampling (100 minutes)
N=length(t);

x=zeros(10,1);
x(end)=1;
accbias = [0;0;0];
gyrobias = [gyroBias*pi/180;0;0];
u = [gravity(gh(1), gh(2)) + accbias; gyrobias];

pos=zeros(3,N);
for n=2:N
   x = Nav_eq(x,u,Ts);
   pos(:,n) = x(1:3);
end

figure(1)
clf
plot(t,pos(1,:)','r',t,pos(2,:)','g',t,pos(3,:)','b', 'LineWidth',5)
grid on
ylabel('Position error [m]')
xlabel('Time [s]')

hold on
yPol = polyfit(t,pos(2,:), polDegree);
plot((0:10:t(end)), polyval(yPol,(0:10:t(end))),'ro')
legend('x:error','y:error','z:error','y:error approximation')
```



Error interpolation

```
simbolic = poly2sym([yPol]);
disp("P_y(x)=")
```

```
P_y(x)=
```

```
disp(simbolic)
```

$$\frac{2633273023360195\,x^3}{9223372036854775808} - \frac{2396001577090687\,x^2}{590295810358705651712} - \frac{7883777512610987\,x}{2361183241434822606848} + \frac{39559532147787}{3689348814741910}$$