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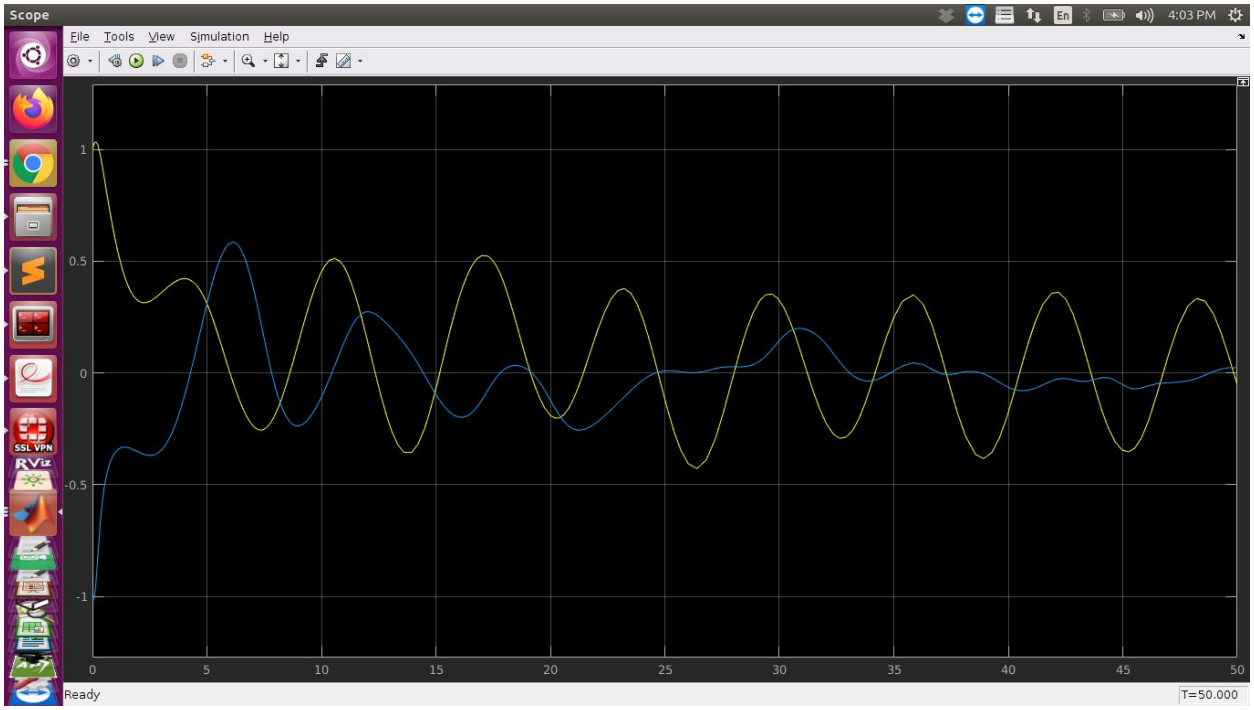
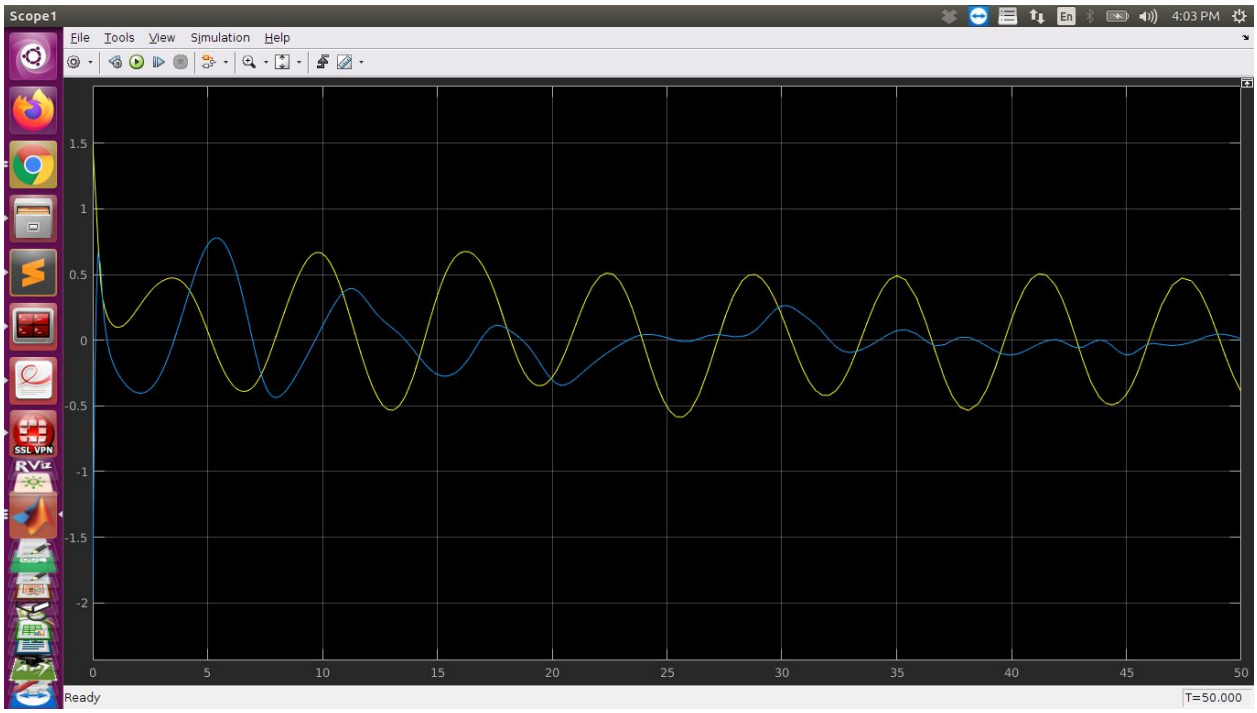
Part 1: gains = 1

Without Noise:

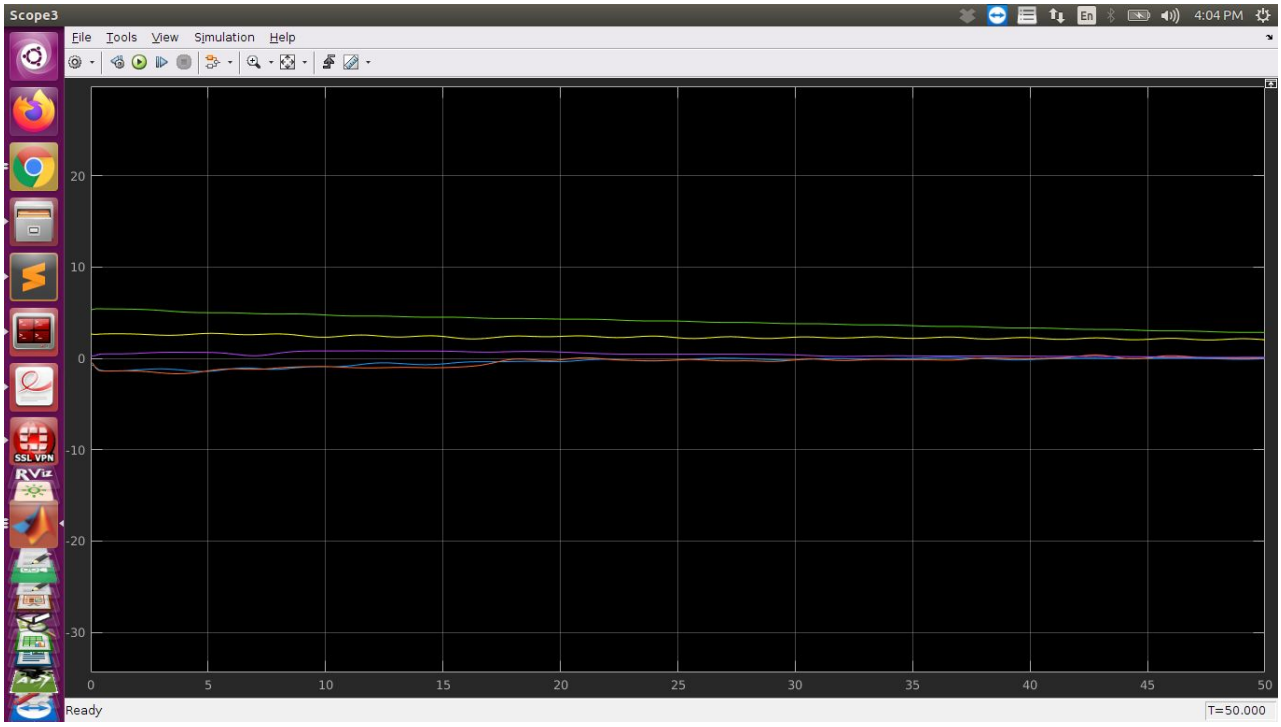
Error



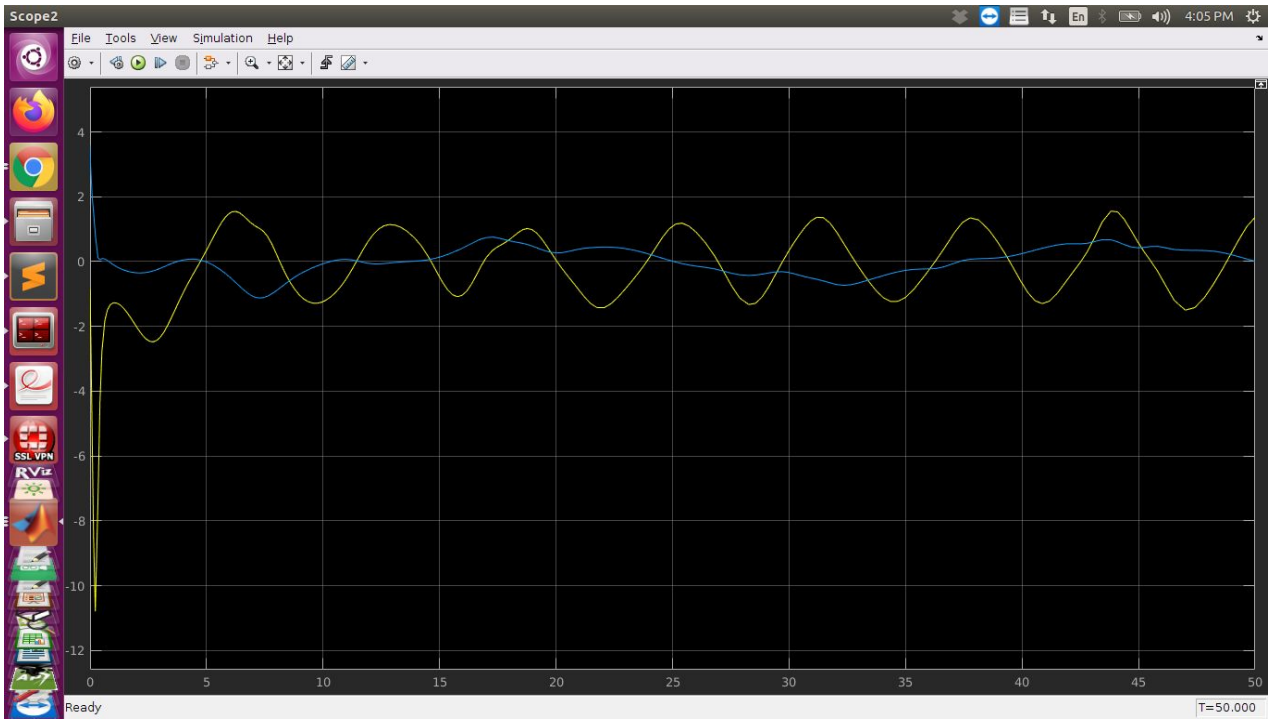
Filter tracking error



Theta tilde

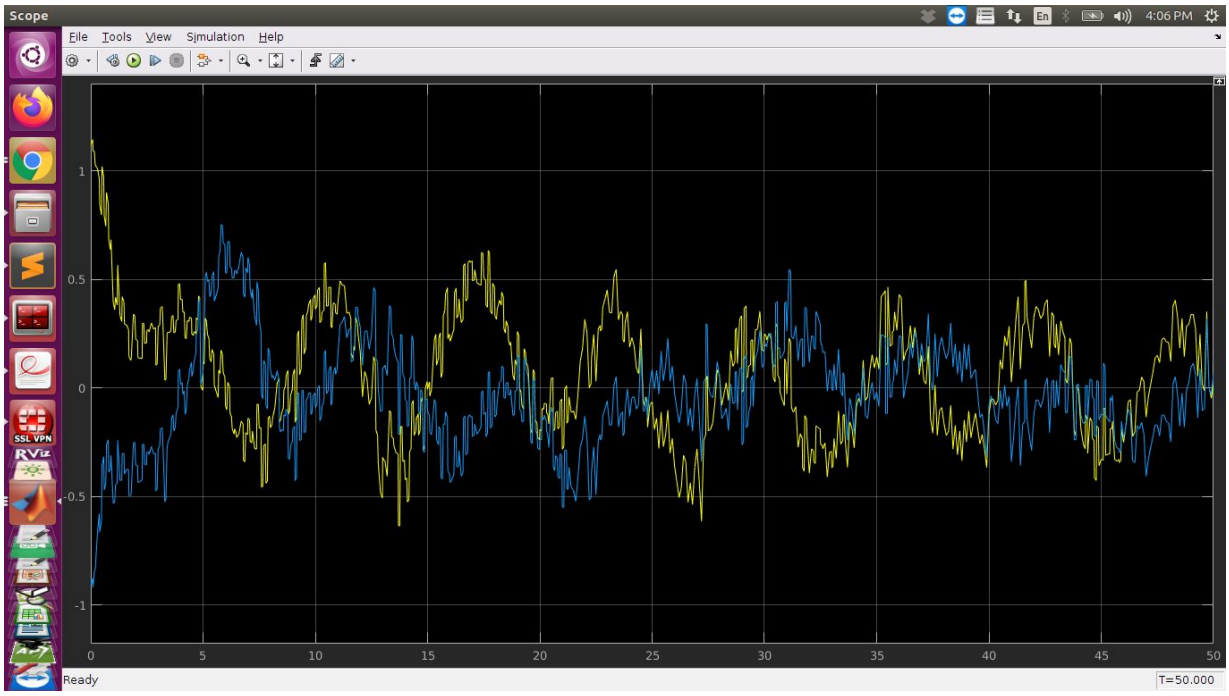


Tau

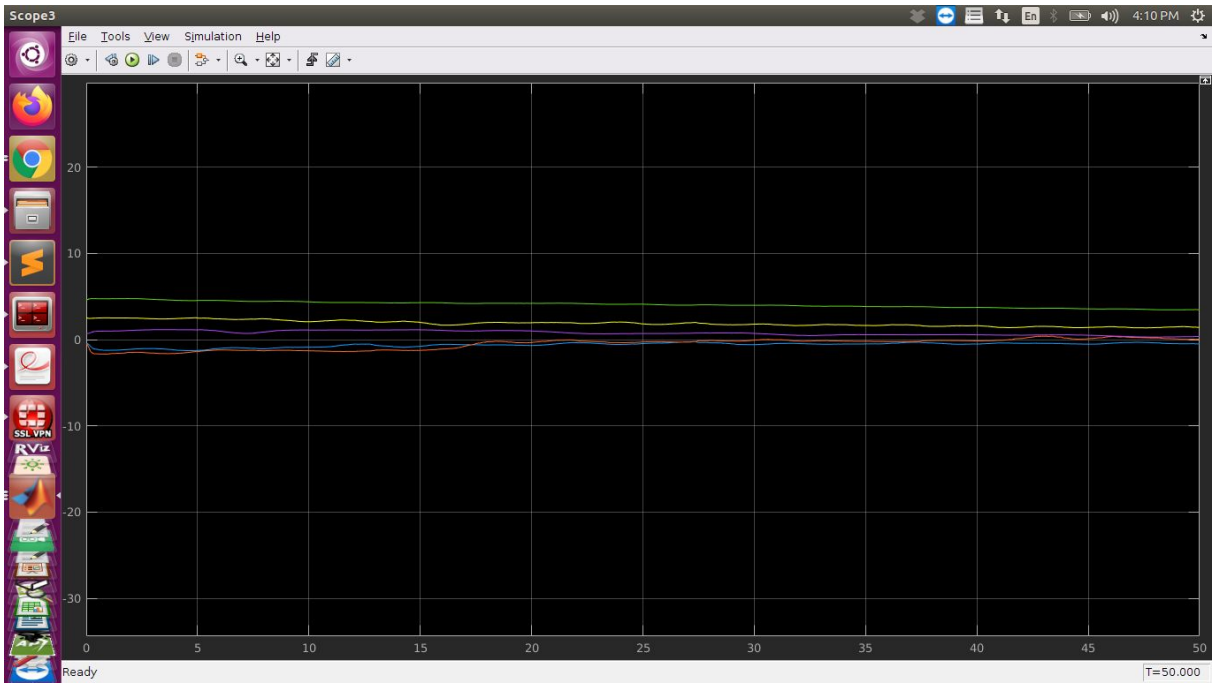


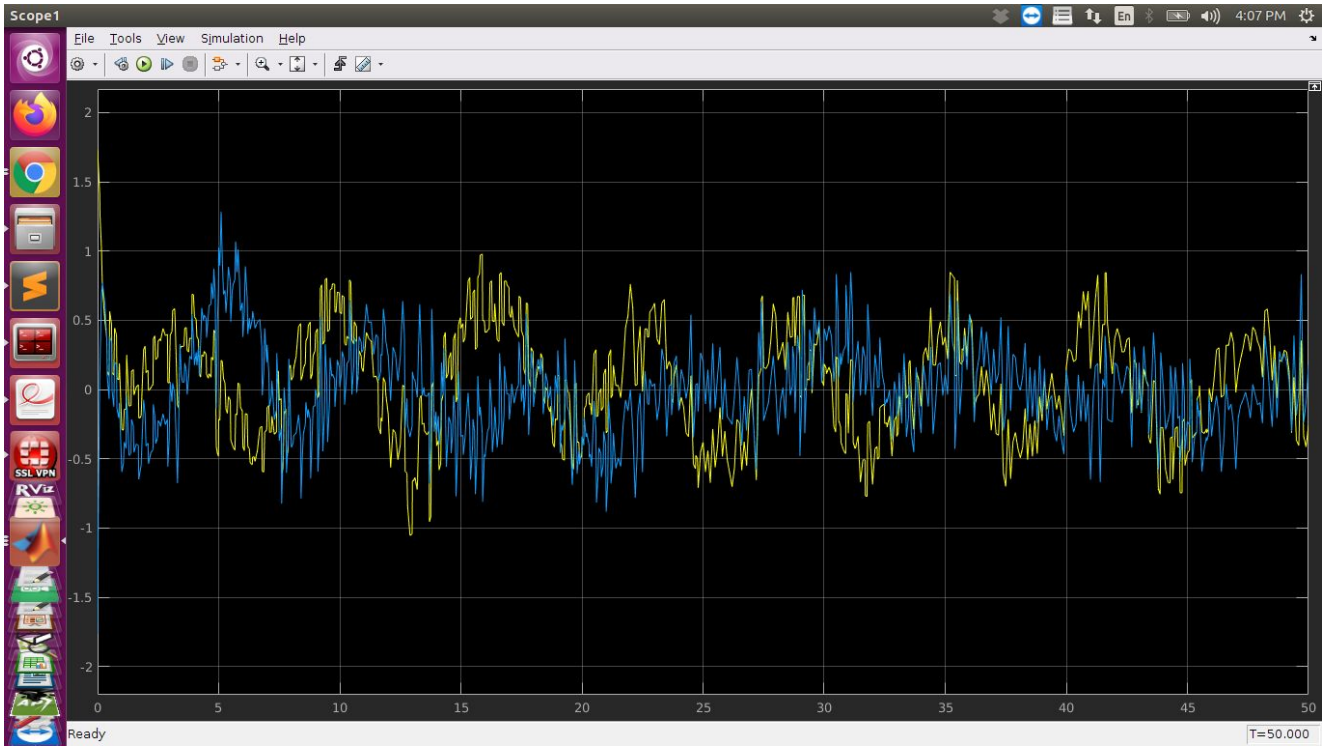
With Noise:

Error



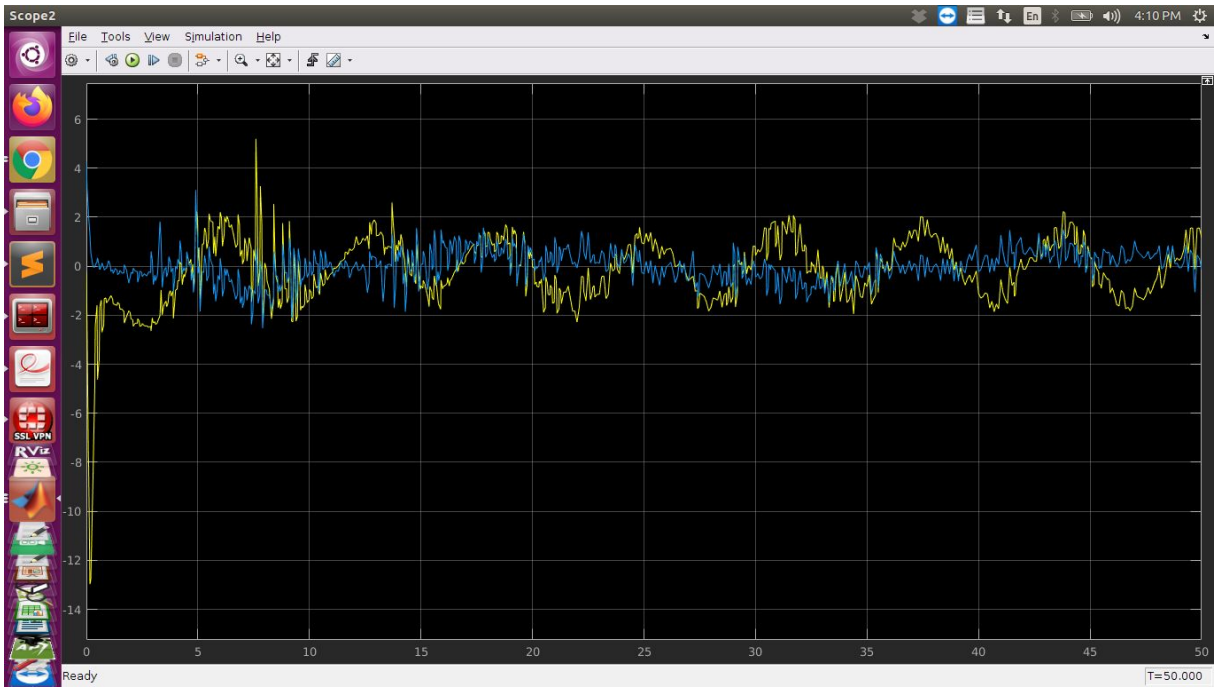
Filter tracking error





Theta tilde

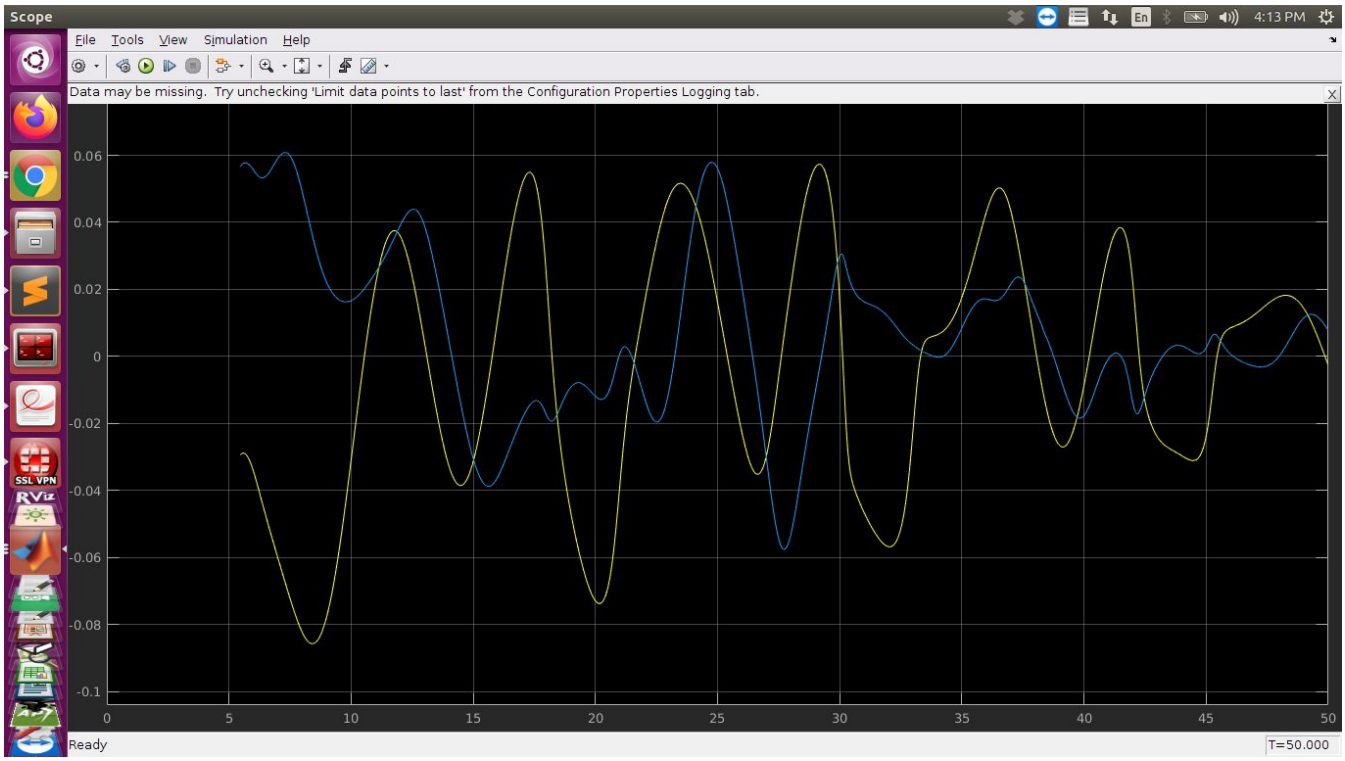
Tau



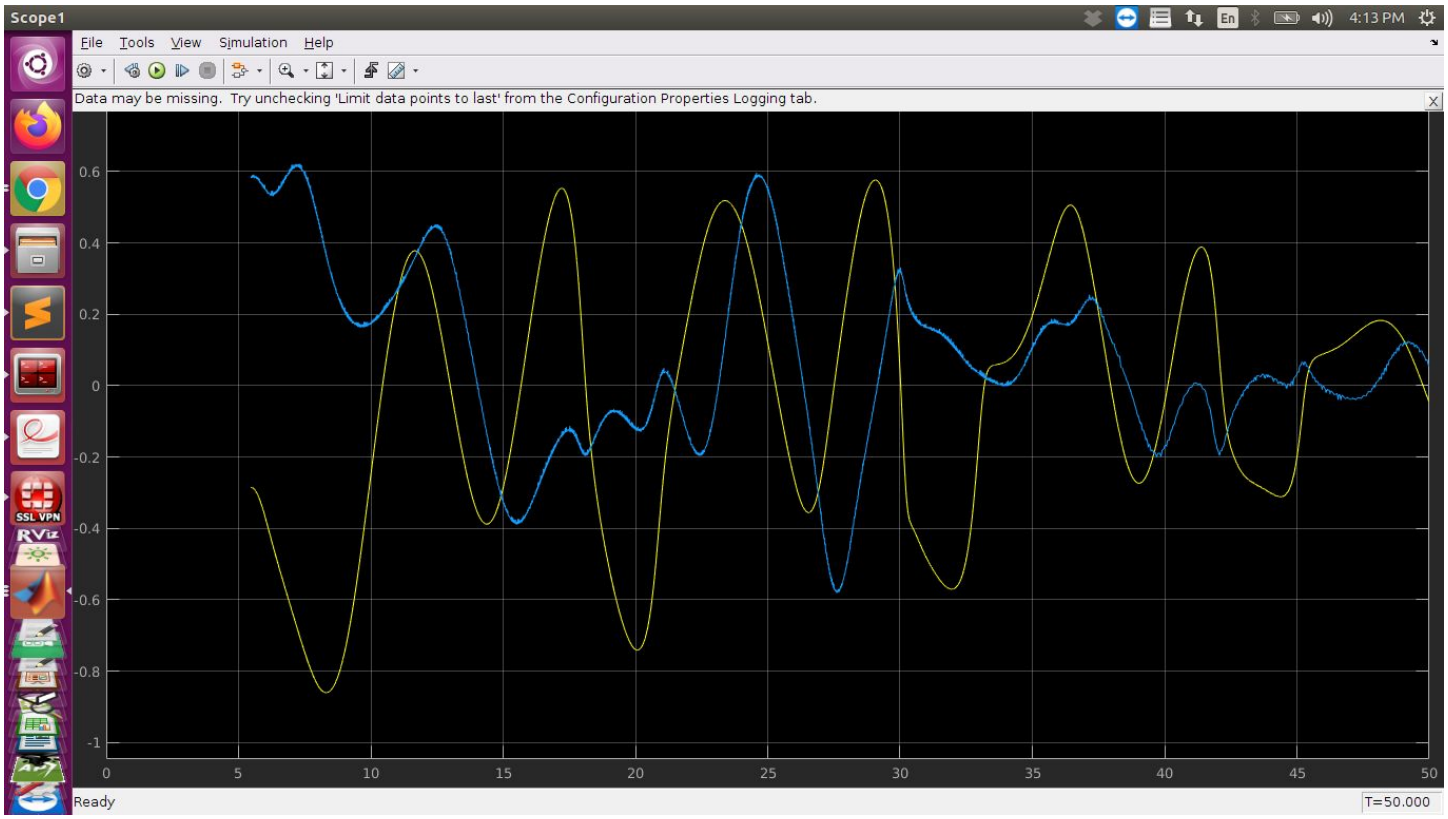
Part2: gains = 10

Without Noise:

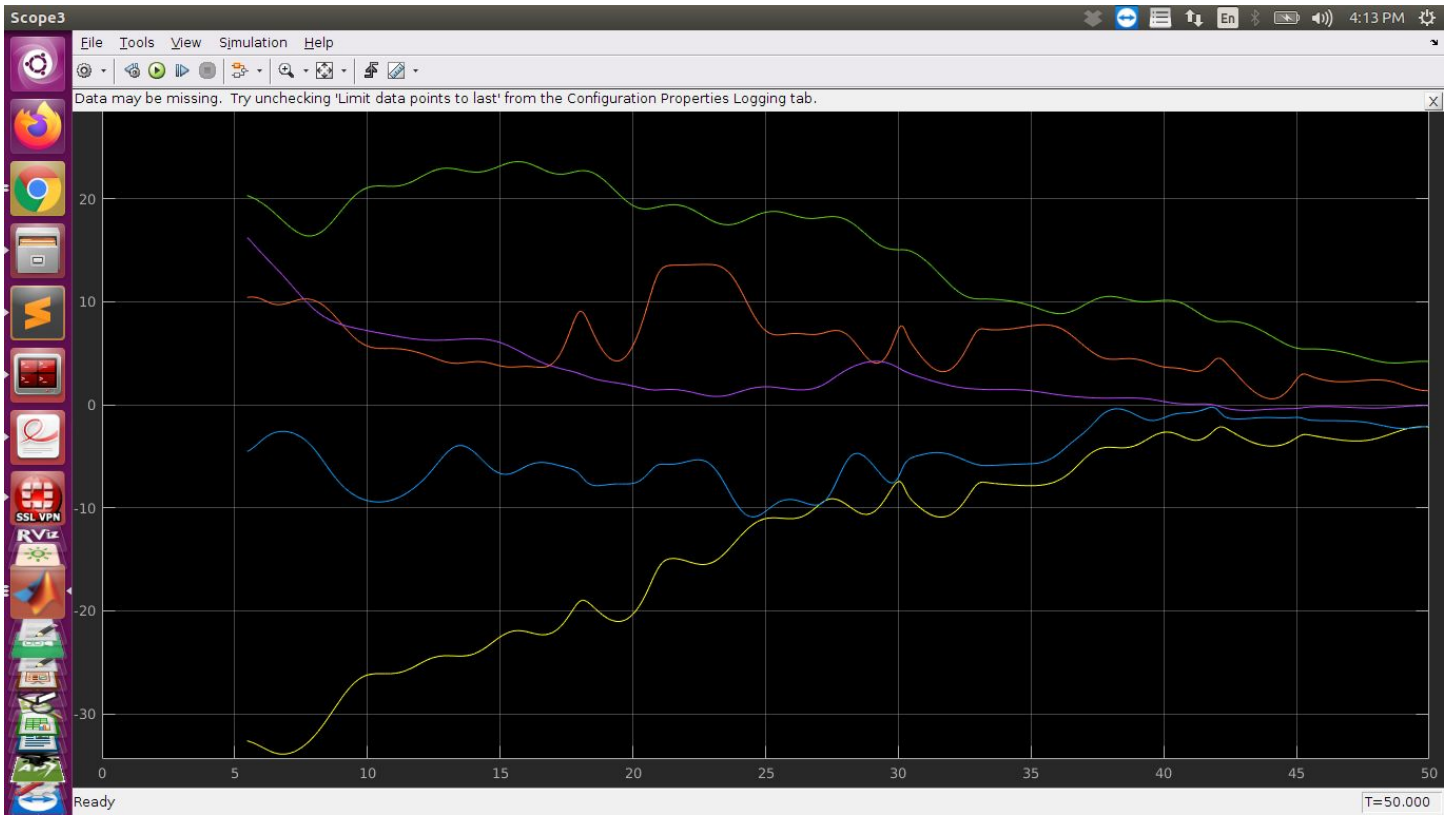
Error



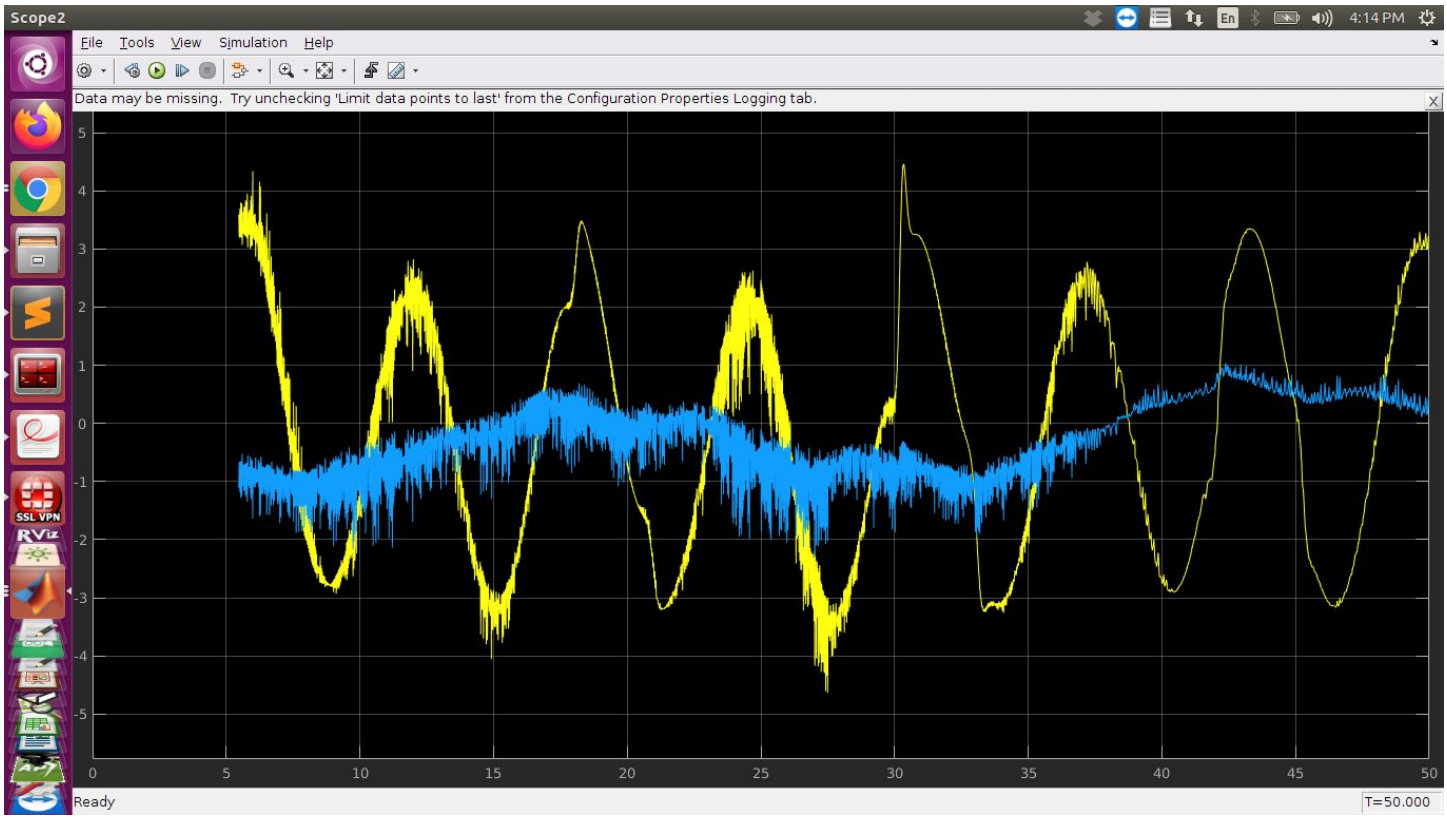
Filter tracking error



Theta tilde

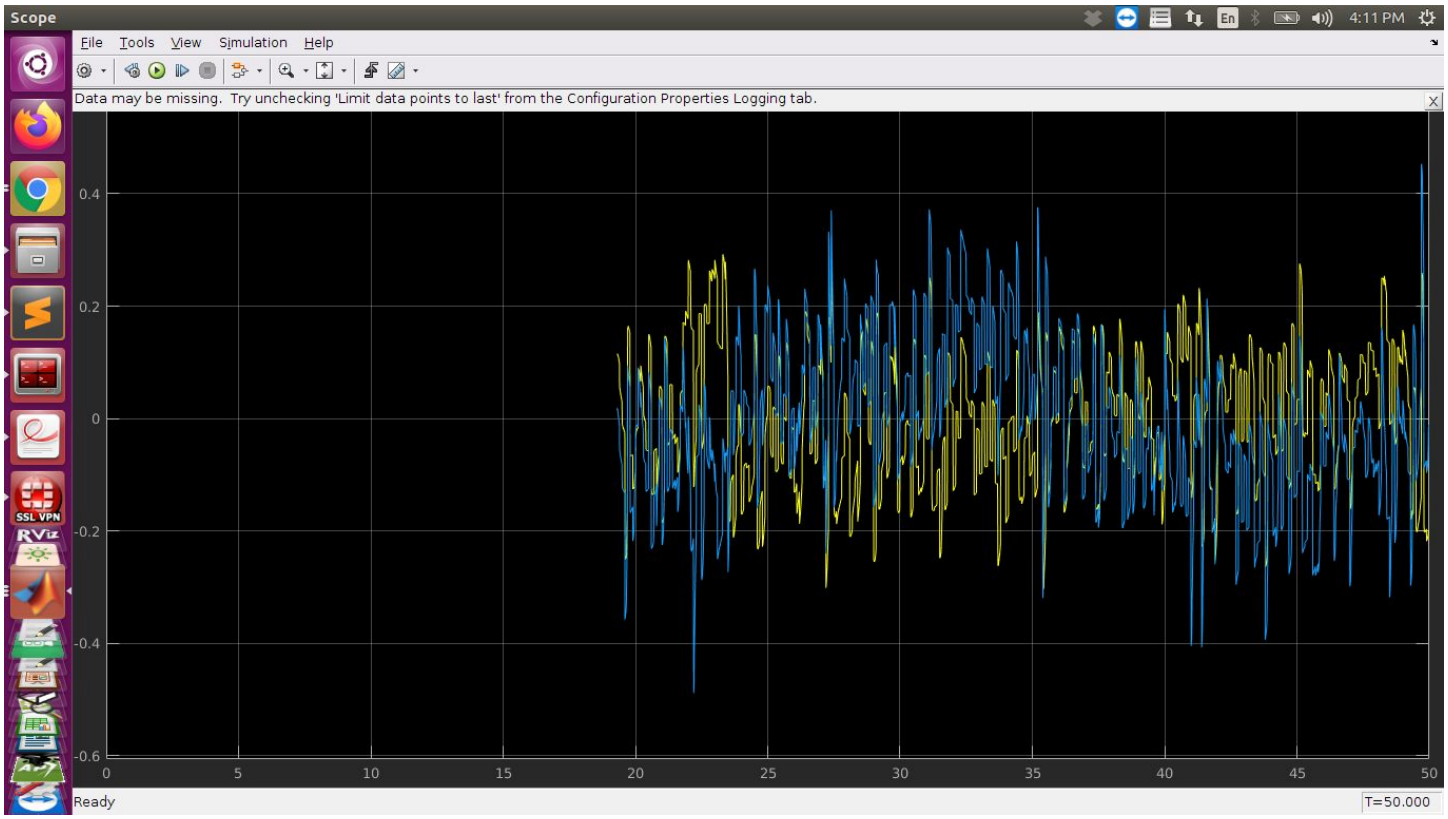


Tau

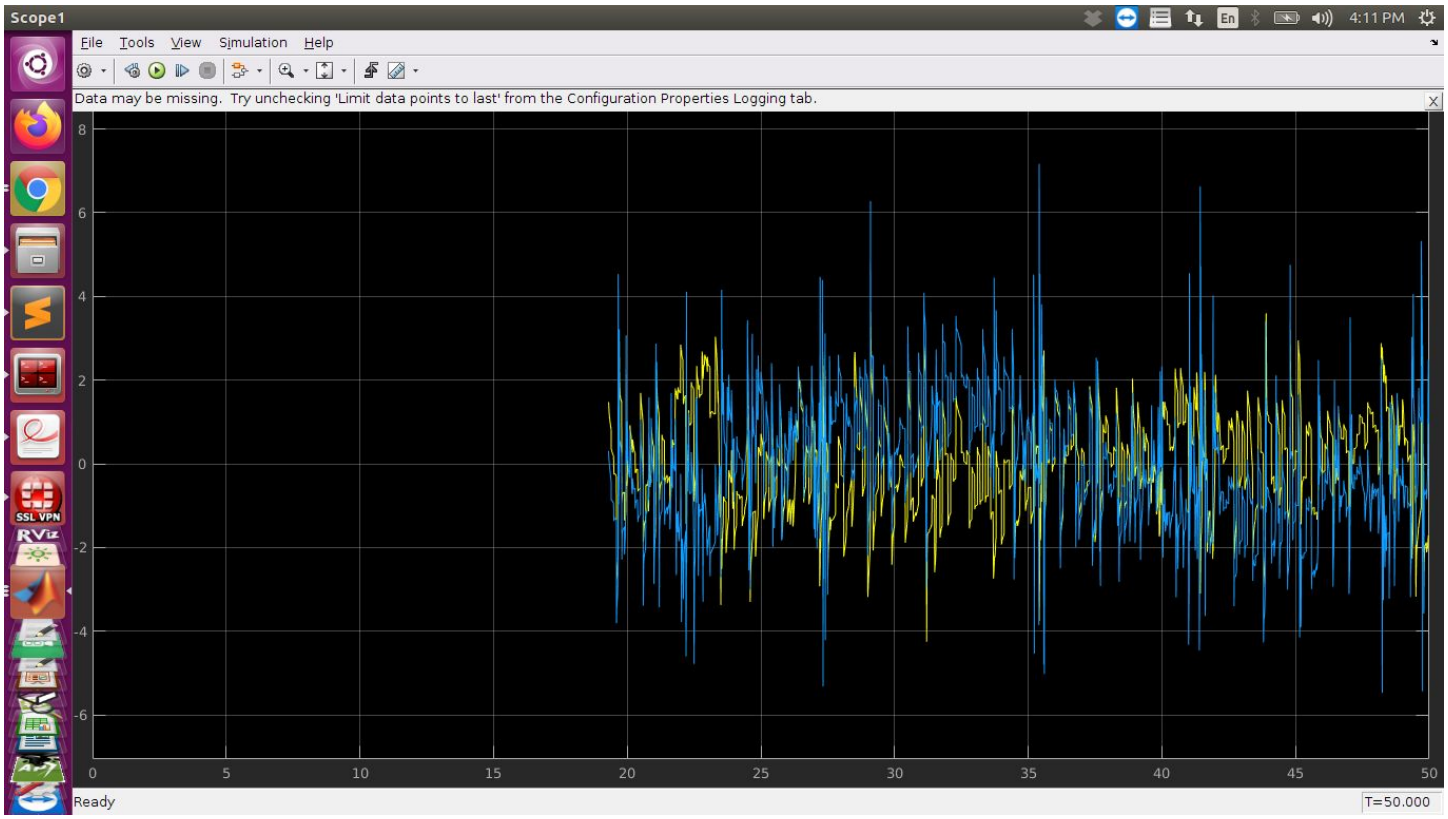


With Noise:

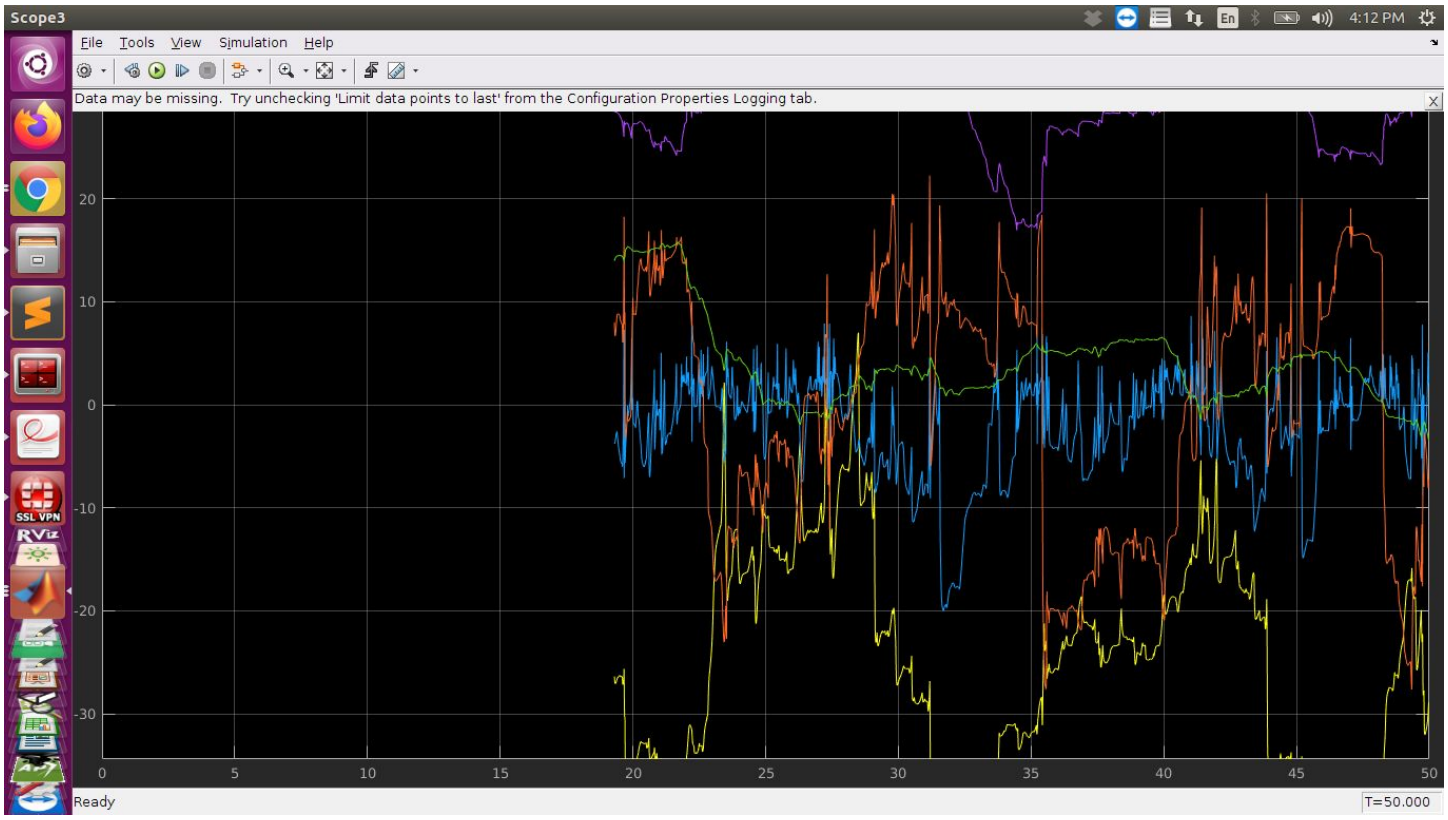
Error



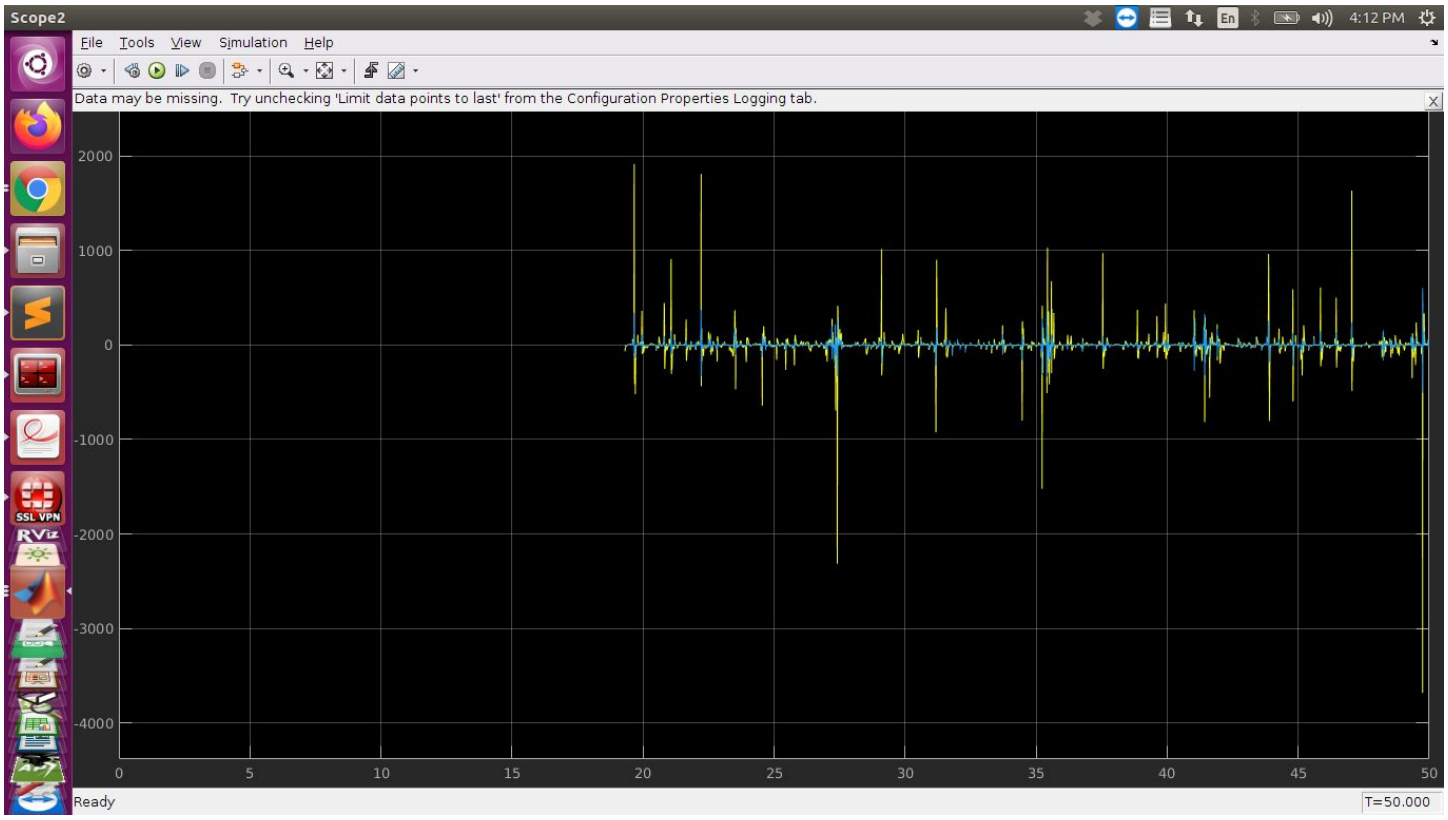
Filter tracking error



Theta tilde


Scope3
File Tools View Simulation Help
Data may be missing. Try unchecking 'Limit data points to last' from the Configuration Properties Logging tab.
20
10
0
-10
-20
-30
0 5 10 15 20 25 30 35 40 45 50
Ready
T=50.000

Tau


Scope2
File Tools View Simulation Help
Data may be missing. Try unchecking 'Limit data points to last' from the Configuration Properties Logging tab.
2000
1000
0
-1000
-2000
-3000
-4000
0 5 10 15 20 25 30 35 40 45 50
Ready
T=50.000

For no noise cases, errors with gain = 10, have more convergence than gain = 1; as we can see above that errors with gain = 10, have a smaller bound of transients (between -0.2 to 0.2) versus bound between -0.5 to 0.5. The tau with more gain has chattering in it.

Comparing the same gains with and without noise, the noisy case has much more transients as compared to non noisy one as can be seen above. Especially when we see the parameter error, more gain has led to a lot of chattering. Error, filter tracking error and Tau has more chattering as compared to without noise. This makes it difficult to converge for noisy case.

When comparing both the noisy gains, the more the gain the worse the situation is, as the feedback increases small errors that many times, and as noise is present hence the controller with high gain suffers a lot. In the noisy case, a smaller gain should be prefered. The parameter estimation are also bad in gain=10 as compared to gain=1.