EE3CL4 – Lab 1 Report
L04 - Group 06 - Tuesday

Yiming Chen, 400230266
Ruiyi Deng, 400240387
cheny466@mcmaster.ca
dengr6@mcmaster.ca

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Contribution:
Ruiyi Deng takes charge of parts I and III
Yiming Chen takes charge of parts II and III

Part I – Lab Environment

Simulation Environment: Both of us use the MATLAB R2021a version to run the provided Simulink file. And for the simulated motor, we use Servo Workspace mode in QUBE 2 – DC Motor in Quanser Interactive Lab v4.26.2.0.

Part II – Data Analysis

In this part, we will focus on the data obtained from the tasks required in the lab.

Attached is the data obtained when gain = 1,

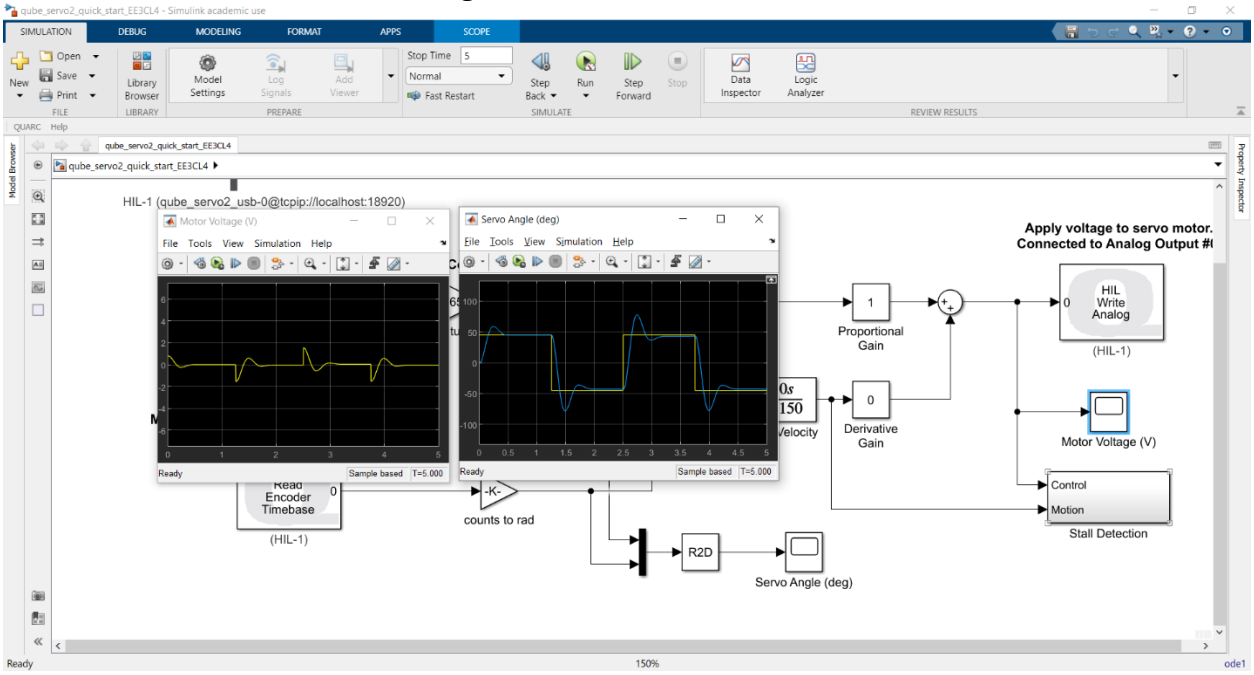

Figure 1 gain = 1

As we increase the gain to 2 and 4, the data obtained is shown below:

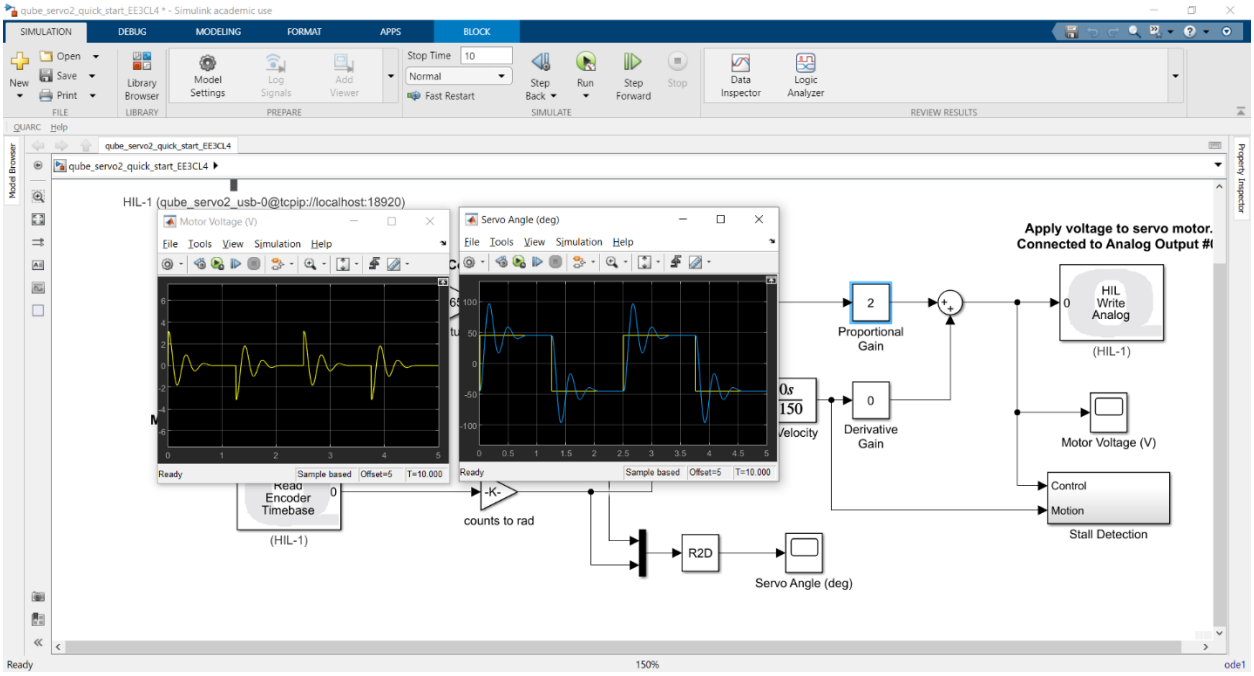

Figure 2 gain = 2

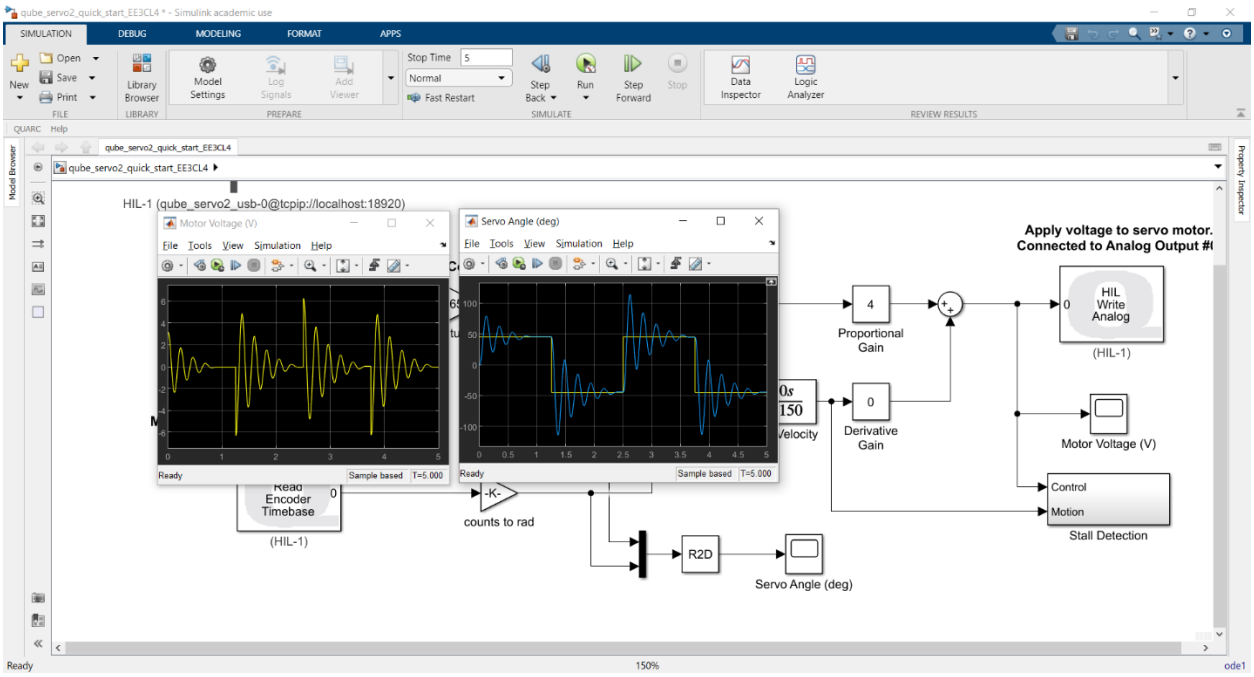

Figure 3 gain = 4

From which we can observe that with increasing gain, the number of ripples in the motor voltage scope and in the servo angle scope is getting more. Apart from that, the peak value of both scopes increases as well. This results in the fluctuation angles of the motor getting larger in

Quanser lab. Also the fluctuation is getting quicker when increasing the gain. This simulation results corresponds to what is displayed in the scope.

Derivative gain is also applied to improve the stability of the motor. We change the derivative gain when gain = 1 to 0.1 and 0.15. Attached below are the results obtained in the lab.

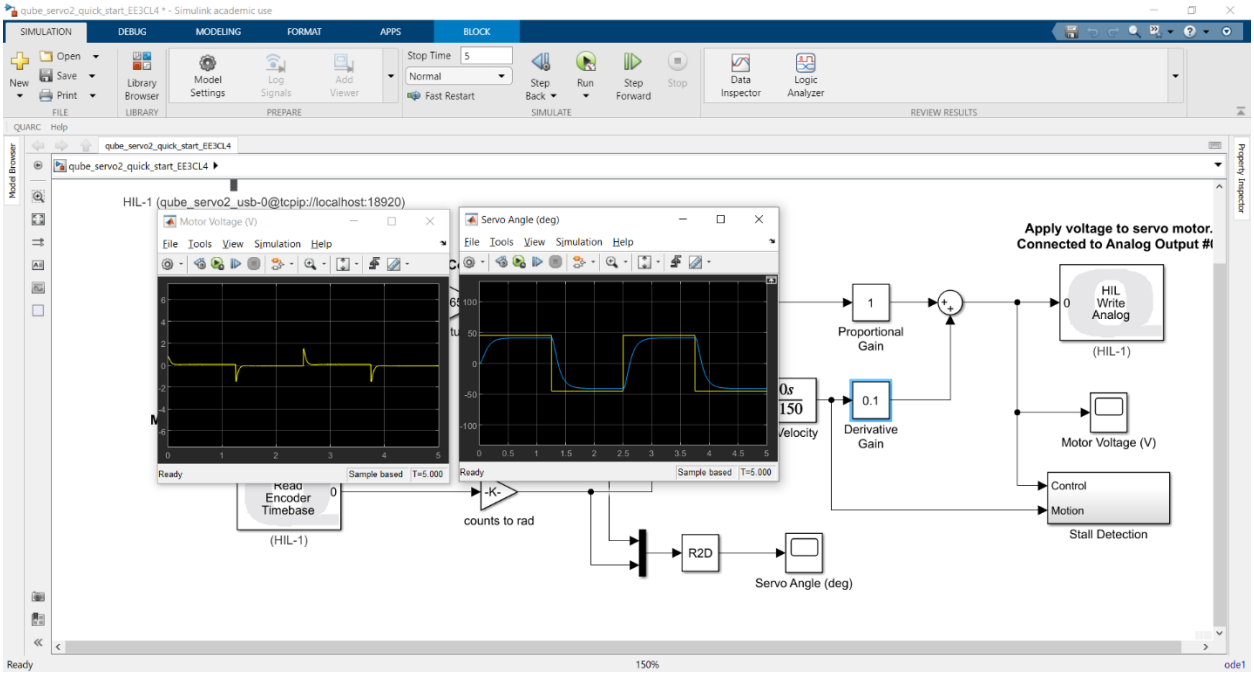

Figure 4 gain = 1 and dev. gain = 0.1

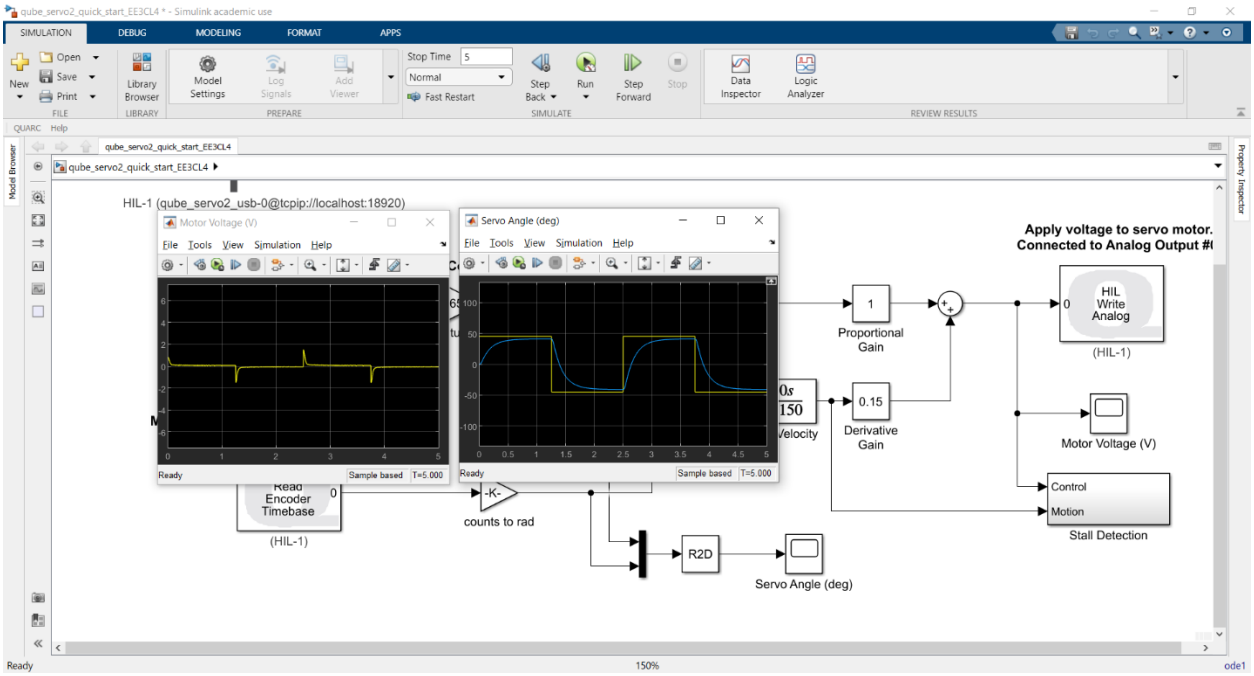

Figure 5 gain = 1 and dev. gain = 0.15

As can be observed that the ripple problems are improved. When reflecting on the simulation results, the motor rotates for the specific angle with less fluctuation and exhibits higher stability.

The scope results for gain = 4 are shown below.

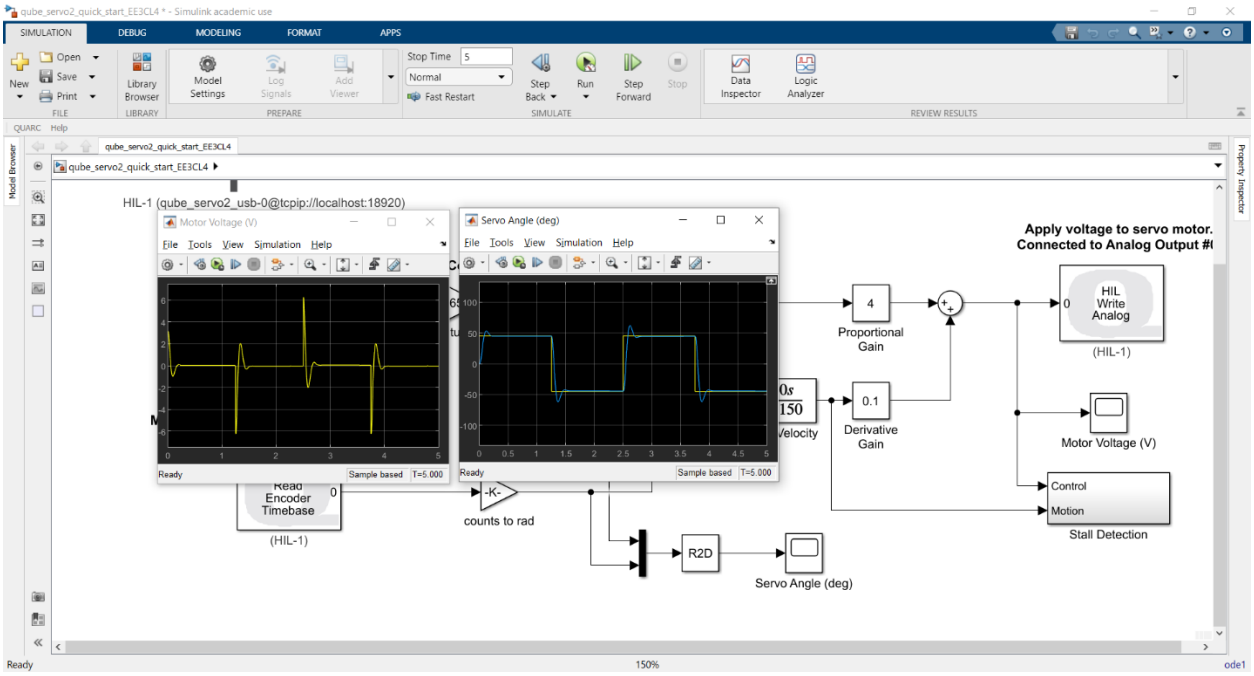

Figure 6 gain = 4 and dev. gain = 0.1

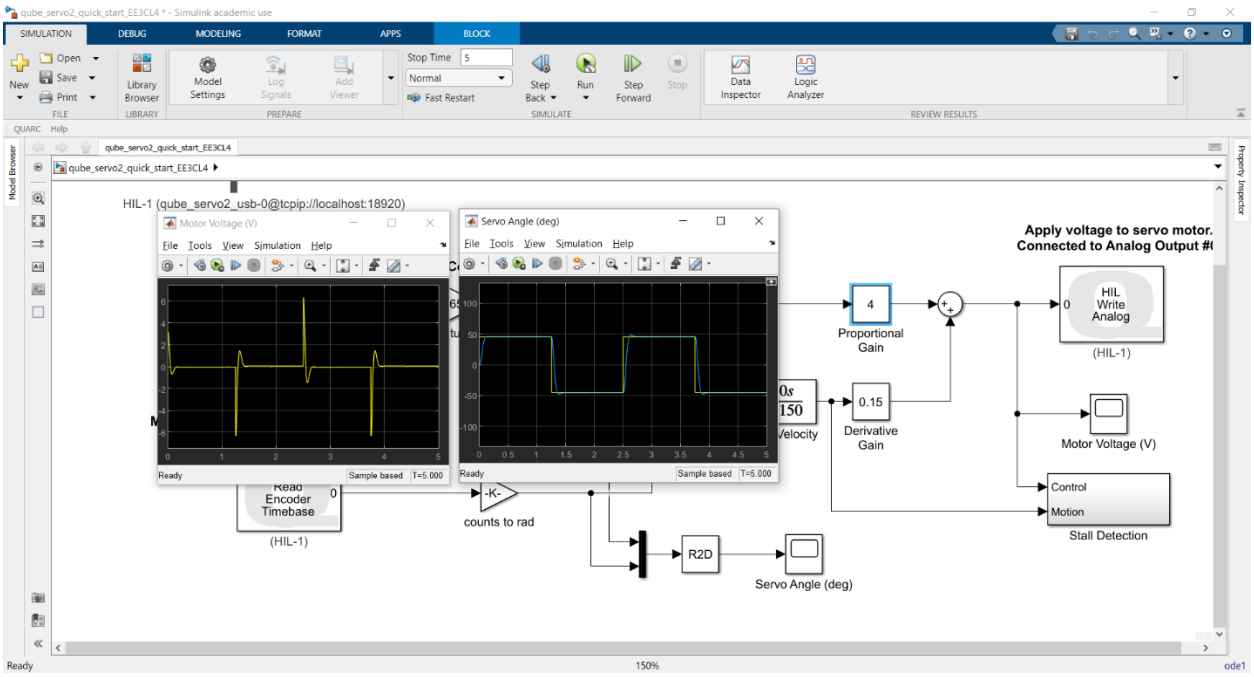

Figure 7 gain = 4 and dev. gain = 0.15

Part III – Discussion

During the lab simulation, we found that there is a D2R module in the block diagram, and we think the reason we need that module is because we need subtract the input amplitude with the HIL-1 module which is counts to radian.

The D2R module is to make them have the same unit. And we also discovered that if we want to make the motor disk turn from 45 degree to 90 degree to each side, we can simply double the number in the Amplitude (deg) module as this module indicate our designated input turning angle of the motor disk.