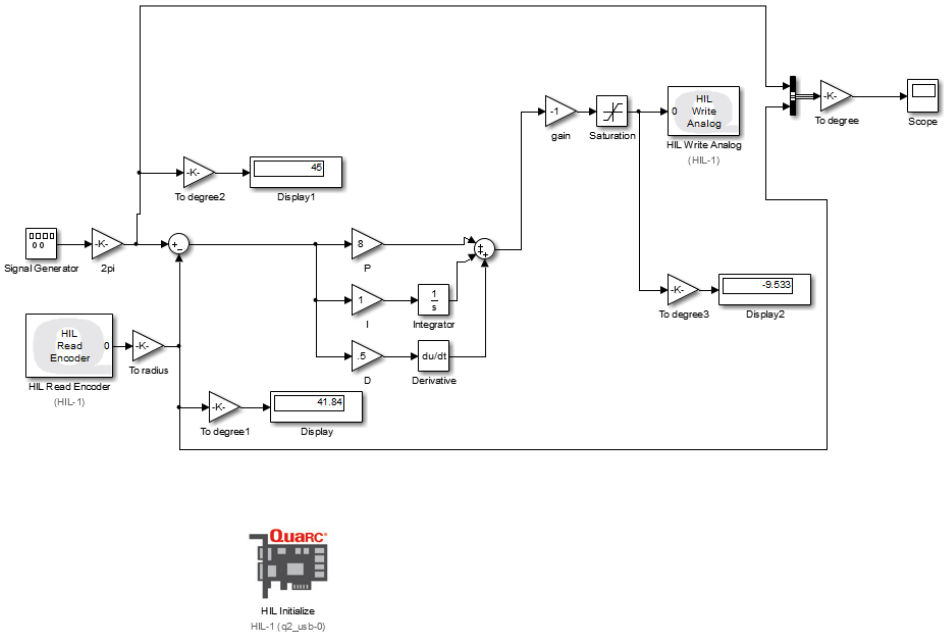
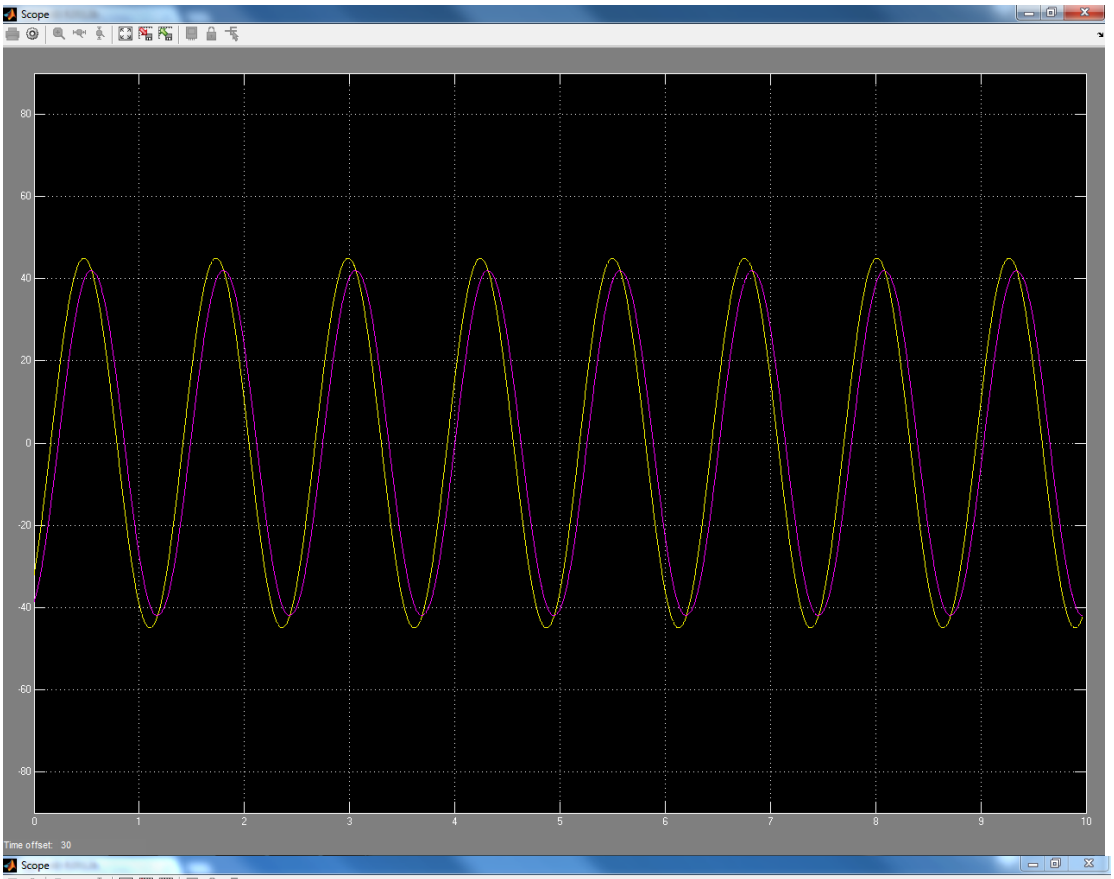
Task objective of Assignment 2 : Build closed-loop position control system with Simulink in conjunction with the Quanser Interface modules.

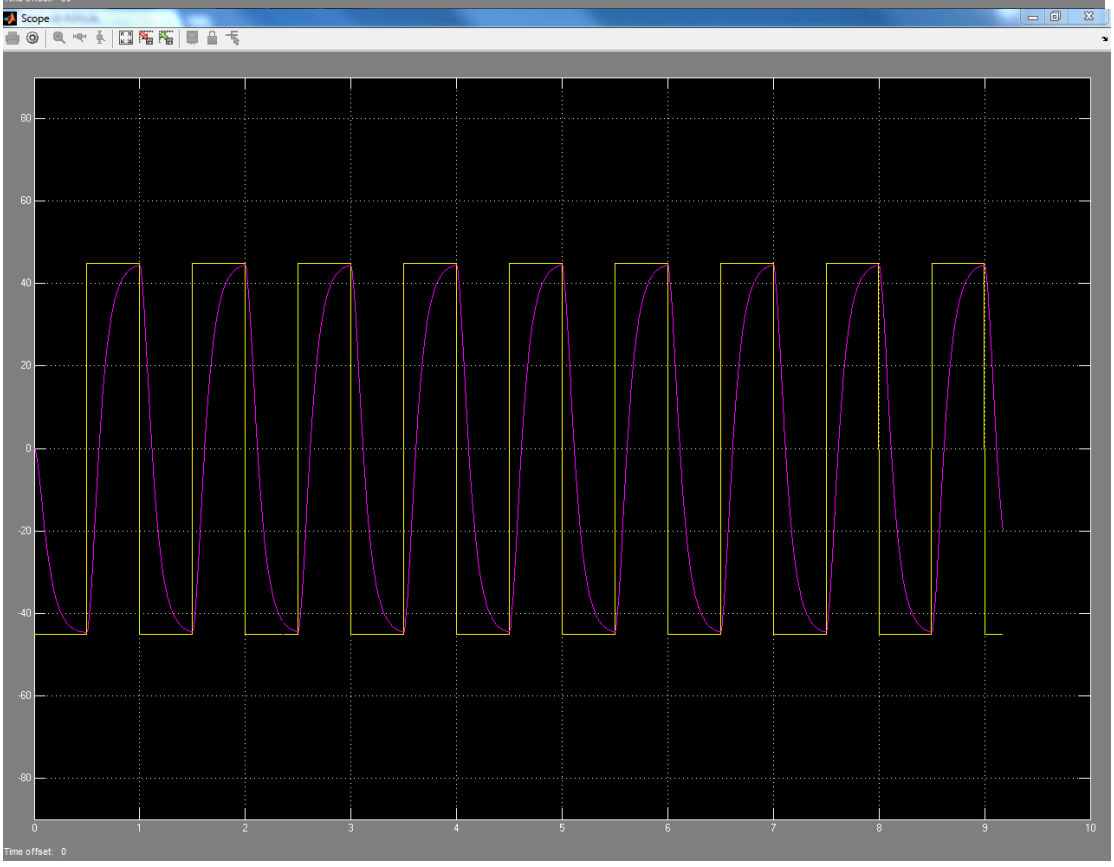
1. Items done this session:

First, we built closed-loop position control system with PID controller. In the process of building the system, we forgot to feed -1 gain in front of the writer block, which we found in the previous Lab assignment but forgot this time. Once set the negative gain, the position control system works well with setting small portion of Differentiate gain.

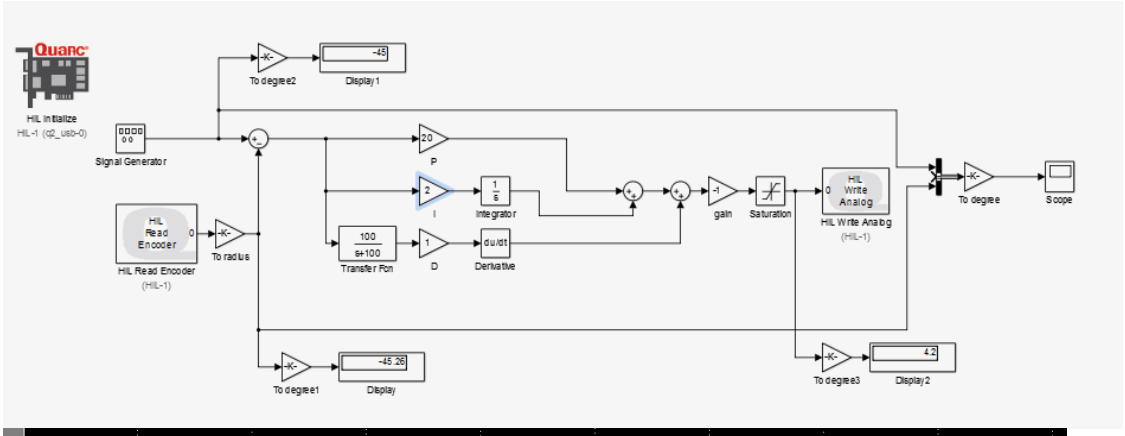


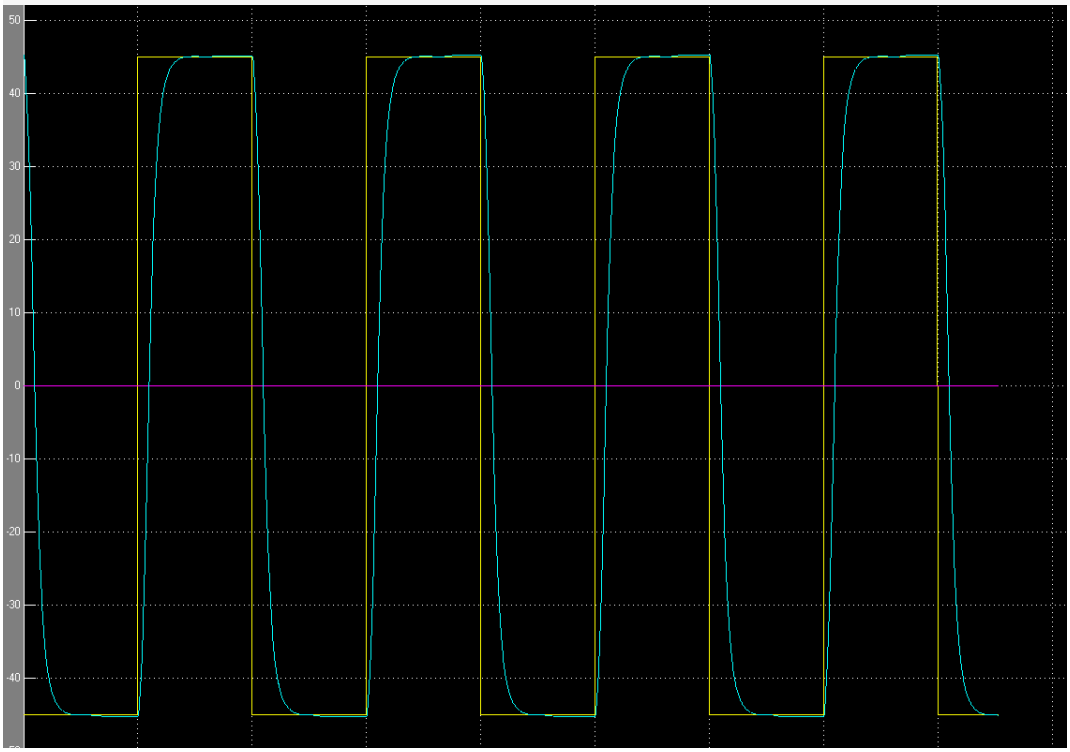
Second, we tested feeding different signals such as sin-wave and square-wave which oscillating between -45 and 45 degrees. In the following pictures, which we can discover time delay, yellow lines are desired signal and purple lines are the actual signal from read-block.





In order to further improve the delay-time through increasing gain of Derivative term and not disturbed by impulses caused by discontinuous signal, we put a low-pass transfer function before the Derivative term. This affects the actual signal to follow the desired signal closer without losing out of control. The yellow line is desired signal and the blue line is actual signal.





When Proportion is high, the output moves faster to the goal, while too high will cause the system unstable.

When Integral is high, the output signal reaches desired value faster and eradicates steady error compared to the pure Proportion.

When Derivative is high, the system is more stable and settling time is shorter.

2. Items for next session:

- Implement "Task3", "Task4" and finish the questions session.

3. Problems / Concerns:

- The waves we tested today have an obvious time delay, which can be further finely tuned through changing the portion of PID gain.