FL. 2018 ESE 447.02 Robotics Lab

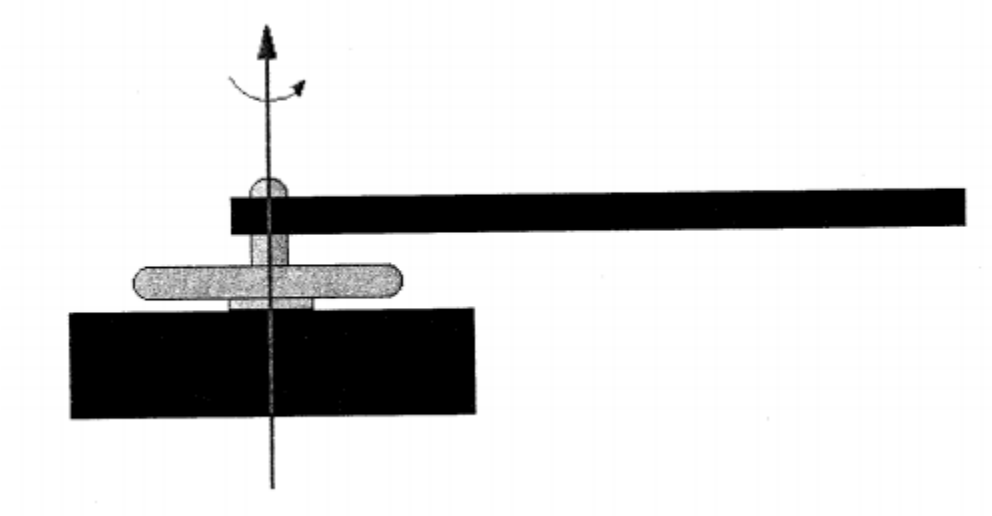
Lab Journal 4

9/29/2018

1. Exercise 2 objectives.

   Use Simulink in conjunction with the Quanser interface modules and the above testbed to gain insight into closed-loop position control, expand experience with Simulink, and gain familiarity with simulation control.

   The system used in this exercise is the same as the one we used in previous exercises.



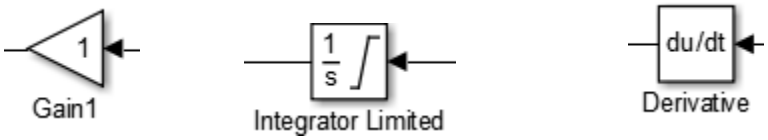
2. Task-1: Create a system which oscillates the link between 45° and -45°.
   (1) Solve this problem as a position control closed-loop feedback system with a parallel PID controller.

   A proportional–integral–derivative controller (PID controller or three term controller) is a control loop feedback mechanism widely used in industrial control systems and a variety of other applications requiring continuously modulated control. A PID controller continuously calculates an error value e(t) as the difference between a desired setpoint (SP) and a measured process variable (PV) and applies a correction based on proportional, integral, and derivative terms (denoted P, I, and D respectively), hence the name.

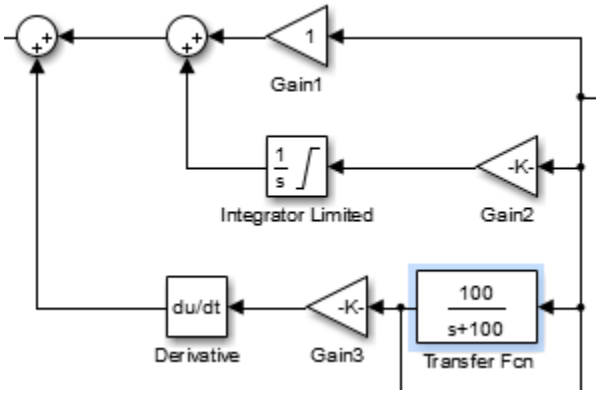
   For this case, the setpoint is the desired position of the arm, i.e. between 45° and -45°. The measured process variable is the actual angle measured by the physical system. The PID controller will be calculating the difference between the desired position angle and the actual position angle e(t) and feed the errors back to form a closed-loop control.

   (2) Construct the PID controller for individual clocks instead of using PID block.
   As is defined above, we can build a PID controller using three blocks that are provided by Simulink library. The gain block can be used as the Proportional part, the integrator limited

block can be used as the integral part, and the derivative block can be used as the derivative part.



Separate gain blocks can be used to control the input for each I and D part.
There is also a Transfer function block in Simulink that can be used to provide the transfer function.
The PID part of this exercise was built like this. The parameters in the blocks can be changed to adjust the performance of the system.



Similar to what we did in previous exercises, the HIL Read Encoder will collect the data and the data is converted to angles by a gain block.