Chapter 5

Modeling SRV-02

The objectives of this laboratory session are:

1. To obtain transfer function models for the SRV-02 from the first-principles as well as from frequency response and time-domain experiments.

5.1   Pre-Lab Assignment

Read this entire chapter as well as the reference [2]. Do the pre-lab calculations in Section 4 of [2]. Keep in mind that

- You can use the parameter values given in Table 5 of [1]. One correction is that the nominal potentiometer sensitivity K_{pot} for our Model 138 potentiometer is 34.5 deg/V instead of 35.2 deg/V, however, this does not actually play a role in this particular lab.

- A disc load will not be attached to the load shaft of your SRV-02. Therefore, the external load moment of inertia $J_{\ell,ext}$ should be set to zero.

- On the right-hand-side of Equation 6 in [2], $\tau_m(t)$ should be $\tau_{m\ell}(t)$.

- Equation 21 in [2] should be $y(t_1) = 0.632(y_{ss} - y_0) + y_0$.

- On the line below Equation 21 in [2], cross out "transfer function".

- Your SRV-02 is in the high-gear configuration. The instructions in [2] is for the high-gear configuration even though, at the beginning of subsection 4.1.5 of [2], it says "low-gear configuration".

5.2   Laboratory Procedure

The laboratory procedure consists of two main steps.

1. Wiring the equipment. This will be exactly the same as in the previous lab. Therefore, follow the same steps as in the previous lab.

2. Building and running a QuaRC code using Simulink to run the SRV-02 as well as to measure various signals from the SRV-02. For this, you can use the MATLAB and Simulink files provided and follow the instructions in Section 5 of [2] with some minor changes. These changes are again due to the difference in our Data Acquisition Card as in the previous lab.

You should of course set the various parameters in the MATLAB and Simulink files to values that are consistent with the equipment. For example, "LOAD_TYPE" in the setup should be set to "NONE".

5.3   In-Lab Assignment and Post-Lab Report

You will follow Section 5 of [2]. Do all calculations, fill all tables, and generate all required figures. Save all of your data and figures. Submit a typed and well-organized lab report to the instructor by the beginning of the next lab session. In you report, explain your reasoning and what you did clearly but concisely.

Bibliography

[1] Quanser SRV-02 User Manual.

[2] Quanser Rotary Experiment #01: Modeling Student Manual.