

Lab 6 (Pole Placement/Feedback Control – Flexible Joint):

Pre-Lab: Read section 3.1 and 3.2 of the Flexible Joint Workbook and answer the questions in section 3.3 before coming to the lab. The state space matrices from lab 5 that are needed should look like

$$A = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 671.7 & -1.9 & 0 \\ 0 & -1098.8 & 1.9 & 0 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$
$$B = \begin{bmatrix} 0 \\ 0 \\ 479.8 \\ -479.8 \end{bmatrix} \quad D = 0$$

Lab Experiment:

1. Connect the Flexible Joint to the SRV02 as shown in the Rotflex User Manual located in C:\User\Student\Matlab\ROTFLEX\References
2. Connect the SRV02, VoltPaq, and Q2_USB data acquisition board with the following changes.
 - a. Do not connect the Tach terminal to the S1&S2 terminal on the SRV02. Instead connect the S1&S2 terminal on the SRV02 to the S1&S2 terminal on the amplifier. The S1&S2 terminal on the SRV02 is left unconnected.
 - b. The white RCA connector does not need to be connected to the analogue input #1
 - c. Connect the encoder terminal on the Flexible joint to the encoder channel #1 on the data acquisition board.
3. Run the experimental setup detailed in section 4.4 and 4.5 of the Flexible Joint Workbook.
 - a. In addition, double-click on the HIL Read Timebase block and change the clock to 0 instead of 1.
 - b. For step 2 in the experiment, the command “ $T = \text{ctrb}(A,B);$ ” can be used to find the controllability matrix.
4. Read and implement the Control Design experiments in section 3.4 of the workbook.
 - a. Make sure the data from the previous lab has been loaded beforehand.
5. Questions posed in the lab are to be answered in the lab report.

Post-Lab: Write a lab report detailing the procedure and results of the experiments run. Guidelines for writing the lab report can be found in section 5 of the Flexible Joint Workbook.