

Final Lab Report Assignment

Draft Version Due: In your lab section the week of April 12-16.

- Submit TWO draft copies of your report to your TA in lab.
- One copy will be evaluated by the Mech. TA and the other by the Communications TA.
- Drafts will be returned to you one week later in lab with comments.
- Draft reports will not receive a grade, but if they are late, you will be penalized 20% per day on your final report grade.
- Drafts should be complete and well written in order to receive valuable feedback.

Final Version Due: In your lab section the week of April 26-29.

- Submit ONE final copy in lab along with your two drafts. The final copy will be graded by the Mechatronics TA.
- A 20% penalty per day will be applied to late lab reports.
- Students in Ben's Friday section 8 may arrange to submit their report outside of lab that day due to conflict with the exam schedule.

Background:

All of the labs this semester build up concepts for measurement, characterization, and control of a DC motor system. For example, Labs #1 and #2 evaluate measurement techniques, Labs #3 and #4 characterize the DC motor, Labs #5 and #6 discuss system response in general, and Lab #7 applies knowledge from all of the aforementioned labs while deriving controllers for the DC motor. The report assignment this semester deals with tying all of these results together into one cohesive report that aims to address characterization and control of a DC motor.

Assignment:

Generate a concise report describing the characterization, control, and evaluation of a DC motor for a robot similar to those that you designed this year. Your report should satisfy the format and structure requirements provided below. Here are some specific application questions to address:

1. How could the motor and sensors be used for position control of a wheel or track on your robot? (Consider that the inertial load driven by the motor simulates the actual robot load)
2. What about velocity control of the wheel or track?
3. What control gains and controller would you need to derive a particular first or second order response and how did those results compare to what you expected? Why would one response be better than another? (e.g. underdamped, overdamped, versus critically damped)
4. Based on your results, what are your final recommendations (conclusions) for sensor suite and controllers for position and velocity control of a DC motor?

In your report, it is necessary to address the experimental techniques used to evaluate the motor, sensors, controllers, etc. For example, a set of motor parameters were used to predict system response and those parameters were derived in Labs #3 and #4 using the sensors evaluated in Labs #1 and #2. Hence, it would be wise to make certain that the report also focuses on the sensors and their role in motor characterization. Some labs may not need to be discussed explicitly (#5 and #6 for example), but the general knowledge discussed therein will be implicitly involved for characterization of your results.

Format Requirements:

- 1) General format: Extended memo format addressed to your TA. See sample memos on website under Lab Handouts.
- 2) Report Structure:
 - a) Introduction: Briefly describe the focus, motivation, and structure of the report.
 - b) Procedures: Briefly describe the experimental methods used to evaluate the above topics.
 - c) Results: Present the results derived during the aforementioned evaluation procedures. Include necessary figures in the text of the report. Supplemental information, such as program code, circuit diagrams, or derivations should be included in the attachments.
 - d) Discussion: Discuss implications and interpretations of results. Remember to focus on how these results may be pertinent to your robot (and specifically the above questions).
 - e) Conclusions
 - f) Attachments: Supplemental or secondary information. Not included in page limit.
- 3) Length: Maximum length of the report is eight pages (seven pages preferred) including Figures. Attachments are not included in the page count. Appropriate conciseness will be rewarded.
- 4) Figures: Include in text, preferably on or after the page where first referenced.
- 5) Line Spacing: Single Spacing.
- 6) Font: 12 point Times Roman
- 7) Margins: 1" Top and Bottom. 1.25" Left and Right
- 8) Collaboration: up to two students may work together on a report.