AE353 (Spring 2019) Design Problem 04 - Peer Review

Instructions

Please complete one of these forms for each review that you have been assigned.

These reviews are "double-blind" - please **do not identify yourself** in your comments. If you identify yourself, your review will be discarded.

Your peers' grades will be computed on the basis of your reviews. In particular, as it says in the design problem statement <https://piazza.com/class_profile/get_resource/jqvfphkdgq129o/jta6mfb5kuj3w0> , 70% of the grade given to each author will be based on your review of their report (60%, with each section worth 15%) and of their code (10%). So, please take these reviews seriously! Please also be respectful and constructive in your comments - they will be given directly to the author.

Identification

If you are reviewing the report called "report_030.pdf", then the ID number of this report is "030". It is **very important** that you choose the correct ID number from the list, so that the review is given to the correct author.

***** 1. What is the ID number of the report that you are reviewing?

Format

2. Does the report have the correct format? (Check all that are true.)

- ☐ It has the correct document type (created with LaTeX, with class "article")
- ☐ It uses 8.5x11 paper
- ☐ It has the correct margins (1 inch on all sides)
- ☐ It has the correct font (computer modern, the default)
- ☐ It has the correct font size (12 point)
- ☐ It has a title
- ☐ It has a date
- ☐ It is exactly four pages

3. Does every citation have the correct format? (Check all that are true. If there is one citation for which it's not true, don't check it.)

- ☐ The report contains at least one citation that is not to Astrom and Murray
- ☐ Citations are numbered in square brackets and are inside punctuation (e.g., "My claim is true [1]." and not "My claim is true. [1]")
- ☐ Citations are treated either as if they were footnote numbers (e.g., "as shown by Astrom and Murray [2]") or as if they were nouns (e.g., "as shown in [2]")
- ☐ Citations never begin sentences (e.g., "As shown by [3], ..." and not "[3] shows that...")
- ☐ Multiple citations are separated by commas or dashes inside a single set of square brackets (e.g., "[4, 5]" and not "[4], [5]" - in LaTeX, this means using "\cite{JohnDoe2010,JaneDoe2012}" and not "\cite{JohnDoe2010}, \cite{JaneDoe2012}")
- ☐ Once a reference has been cited by number, this same number is used in all subsequent citations to the same reference in the report
- ☐ All references cited in the report are listed in a section called "References" that appears at the end of the report
- ☐ The list of references in the report has the same format as the list of references that appears in the design problem statement

Goal (15%)

The report should...

- state a goal;
- define one requirement;
- define one verification.

The requirement should be quantifiable, relevant, and detailed. The verification should be based on a measurement, should have a clear set of instructions for how to make the measurement, and should have a clear set of instructions for how to interpret the results.

This content could be in a section called "Goal", or the report could be organized in some other way. To keep things simple, the questions below refer to goal-related content as "this section", even if the report you are reading is organized differently. It is up to you to decide if the presentation is effective.

Evaluate this section in three ways.

First, make sure that nothing is missing. Don't worry about quality, just check for existence.

4. Does this section satisfy the minimum requirements? (Check all that are true.)

- ☐ I can find this section (or the content that should be inside it) somewhere in the report
- ☐ It states a goal
- ☐ It defines one requirement
- ☐ It defines one verification

Second, give this content a score. Here is a rubric, with things you might be thinking associated with different scores:

- (11) This section is exceptional. It could not possibly be improved.
- (10) I easily understood this section. I might have done things differently, but I can't find anything that needs to be improved.
- (8-9) I had to read this section more than once in order to understand it. It could be improved in at least one way. I found one small mistake.
- (5-7) I had to read this section many times in order to understand it. It could be improved in several ways. I found more than one small mistake, or one big mistake.
- (1-4) I did not understand this section. It could be improved in significant ways. I found many small mistakes, or more than one big mistake.
- (0) This section was missing from the report.

Scores of "11" will be very rare.

***** 5. To what extent is this section clear, correct, and informative? (11 is the highest score, 0 is the lowest score.)

Third, say why you chose the score that you did.

***** 6. Justify your score. (What did you struggle to understand? What mistakes did you find? What dubious claims were made without supporting evidence? What could have been improved, and how could it have been improved? Please be specific and constructive.)

*limited to **200** words.*

Model (15%)

The report should...

- describe the system dynamics by a set of nonlinear ODEs;
- linearize these ODEs about some equilibrium point;
- express the result in state-space form.

Any choices made (e.g., which equilibium point) should be justified. Sufficient detail should be provided to convince readers that results are correct.

This content could be in a section called "Model", or the report could be organized in some other way. To keep things simple, the questions below refer to model-related content as "this section", even if the report you are reading is organized differently. It is up to you to decide if the presentation is effective.

Evaluate this section in three ways.

First, make sure that nothing is missing. Don't worry about quality, just check for existence.

7. Does this section satisfy the minimum requirements? (Check all that are true.)

- ☐ I can find this section (or the content that should be inside it) somewhere in the report
- ☐ It presents the nonlinear model
- ☐ It makes a choice of equilibrium point
- ☐ It gives a reason for the choice of equilibrium point
- ☐ It defines the state, input, and (if necessary) output
- ☐ It presents the linear model in state-space form

Second, give this section a score. Here is a rubric, with things you might be thinking associated with different scores:

- (11) This section is exceptional. It could not possibly be improved.
- (10) I easily understood this section. I might have done things differently, but I can't find anything that needs to be improved.
- (8-9) I had to read this section more than once in order to understand it. It could be improved in at least one way. I found one small mistake.
- (5-7) I had to read this section many times in order to understand it. It could be improved in several ways. I found more than one small mistake, or one big mistake.
- (1-4) I did not understand this section. It could be improved in significant ways. I found many small mistakes, or more than one big mistake.
- (0) This section was missing from the report.

Scores of "11" will be very rare.

***** 8. To what extent is this section clear, correct, and informative? (11 is the highest score, 0 is the lowest score.)

Third, say why you chose the score that you did.

***** 9. Justify your score. (What did you struggle to understand? What mistakes did you find? What dubious claims were made without supporting evidence? What could have been improved, and how could it have been improved? Please be specific and constructive.)

*limited to **200** words.*

Control Design (15%)

The report should...

- determine if the open-loop linear system is observable and controllable;
- design an observer and a controller;
- verify that the closed-loop linear system is asymptotically stable.

Most likely, these results will be stated as *predictions*, because nothing will have been implemented or tested in nonlinear simulation yet, and because there is - of course - no need to verify predictions made about the linear system in simulation (we *know* that these predictions are true for the linear system). Any choices made (e.g., which approach to design, which gains or weights, etc.) should be justified. Sufficient detail should be provided to convince readers that results are correct.

This content could be in a section called "Control Design", or the report could be organized in some other way. To keep things simple, the questions below refer to design-related content as "this section", even if the report you are reading is organized differently. It is up to you to decide if the presentation is effective.

Evaluate this section in three ways.

First, make sure that nothing is missing. Don't worry about quality, just check for existence.

10. Does this section satisfy the minimum requirements? (Check all that are true.)

- ☐ I can find this section (or the content that should be inside it) somewhere in the report
- ☐ It has an analysis of observability
- ☐ It has an analysis of controllability
- ☐ It presents the design of an observer
- ☐ It presents the design of a controller
- ☐ It has an analysis of closed-loop stability

Second, give this section a score. Here is a rubric, with things you might be thinking associated with different scores:

- (11) This section is exceptional. It could not possibly be improved.
- (10) I easily understood this section. I might have done things differently, but I can't find anything that needs to be improved.
- (8-9) I had to read this section more than once in order to understand it. It could be improved in at least one way. I found one small mistake.
- (5-7) I had to read this section many times in order to understand it. It could be improved in several ways. I found more than one small mistake, or one big mistake.
- (1-4) I did not understand this section. It could be improved in significant ways. I found many small mistakes, or more than one big mistake.
- (0) This section was missing from the report.

Scores of "11" will be very rare.

***** 11. To what extent is this section clear, correct, and informative? (11 is the highest score, 0 is the lowest score.)

Third, say why you chose the score that you did.

***** 12. Justify your score. (What did you struggle to understand? What mistakes did you find? What dubious claims were made without supporting evidence? What could have been improved, and how could it have been improved? Please be specific and constructive.)

*limited to **200** words.*

Results (15%)

The report should...

- consider at least three different control designs (e.g., different controller and observer eigenvalues, or different weighting matrices, or different control architectures - with and without reference tracking or integral action, etc.);
- for each control design you consider, (1) identify at least one situation - e.g., one part of one road - that causes failure, (2) say why the failure occurred, providing evidence to support your argument, (3) suggest a change to the design that would eliminate the failure, and verify in simulation that it does;
- for your final control design, say how it was implemented;
- provide evidence that the requirement was satisfied by following the instructions that were given earlier in the report for verifying this requirement.

Sufficient detail should be provided to convince readers that results are correct. Remember that figures are helpful in this regard.

This content could be in a section called "Results", or the report could be organized in some other way. To keep things simple, the questions below refer to results-related content as "this section", even if the report you are reading is organized differently. It is up to you to decide if the presentation is effective.

Evaluate this section in three ways.

First, make sure that nothing is missing. Don't worry about quality, just check for existence.

13. Does this section satisfy the minimum requirements? (Check all that are true.)

- ☐ I can find this section (or the content that should be inside it) somewhere in the report
- ☐ It considers at least three different control designs
- ☐ For each design (except the last), it identifies at least one road that causes failure
- ☐ For each failure case, it provides evidence to support a hypothesis about why the failure occurred
- ☐ For each failure case, it suggests a change to the control design that would eliminate the failure, and verifies in simulation that it does
- ☐ It provides sufficient detail for you to understand how the final control design was implemented
- ☐ It shows the results of following the instructions for verification
- ☐ It draws a conclusion from these results about whether or not the requirement was satisfied

Second, give this section a score. Here is a rubric, with things you might be thinking associated with different scores:

- (11) This section is exceptional. It could not possibly be improved.
- (10) I easily understood this section. I might have done things differently, but I can't find anything that needs to be improved.
- (8-9) I had to read this section more than once in order to understand it. It could be improved in at least one way. I found one small mistake.
- (5-7) I had to read this section many times in order to understand it. It could be improved in several ways. I found more than one small mistake, or one big mistake.
- (1-4) I did not understand this section. It could be improved in significant ways. I found many small mistakes, or more than one big mistake.
- (0) This section was missing from the report.

Scores of "11" will be very rare.

***** 14. To what extent is this section clear, correct, and informative? (11 is the highest score, 0 is the lowest score.)

Third, say why you chose the score that you did.

***** 15. Justify your score. (What did you struggle to understand? What mistakes did you find? What dubious claims were made without supporting evidence? What could have been improved, and how could it have been improved? Please be specific and constructive.)

*limited to **200** words.*

Code (10%)

The report should be accompanied by code that is written in MATLAB, using the templates "`Controller.m`" and "`Test.m`". When "`Test.m`" is executed in MATLAB (R2018b) in a folder with "`Controller.m`", with "`DesignProblem04.m`", with "`MakeRoad.m`" (so, *not* a "`road.mat`" file - the test code will have to use "`MakeRoad.m`" to create one), and with "`DesignProblem04_EOMs.mat`", it should run without error and should produce results that are consistent with what was presented in the report. In particular, these results - if interpreted as described in the report - should verify that the requirement was satisfied. Evaluate the code in three ways.

First, make sure that nothing is missing. Don't worry about quality, just check for existence.

16. Does the code satisfy the minimum requirements? (Check all that are true.)

- ☐ The code includes both "Test.m" and "Controller.m"
- ☐ When I run the script "Test.m" in MATLAB (R2018b) with the correct working directory, MATLAB throws no error and shows no warning that the controller has been turned off

Second, give the code a score. Here is a rubric, with things you might be thinking associated with different scores:

- (11) The code is exceptional. It could not possibly be improved.
- (10) I easily understood the code. I might have done things differently, but I can't find anything that needs to be improved.
- (8-9) I had to read the code more than once in order to understand it. It could be improved in at least one way. I found one small mistake.
- (5-7) I had to read the code many times in order to understand it. It could be improved in several ways. I found more than one small mistake, or one big mistake.
- (1-4) I did not understand the code. It could be improved in significant ways. I found many small mistakes, or more than one big mistake.
- (0) The code was missing.

Scores of "11" will be very rare.

***** 17. To what extent is the code clear, correct, and consistent with what the report says was implemented? (11 is the highest score, 0 is the lowest score.)

Third, say why you chose the score that you did.

***** 18. Justify your score. (What did you struggle to understand? What mistakes did you find? What could have been improved, and how could it have been improved? Please be specific and constructive.)

*limited to **200** words.*

Positive Feedback

* 19. What is one really good aspect of this report, and why is it effective? Please be specific and write at least one complete sentence.

*limited to **200** words.*

Summary

* 20. If you had to give this report a single, numerical score - with "100" being the highest and "0" being the lowest - what would it be?

Process

* 21. How long did it take you to complete this review?

- ◯ 15 minutes (or less)
- ◯ 16 - 30 minutes
- ◯ 31 - 45 minutes
- ◯ 46 - 60 minutes
- ◯ more than 60 minutes